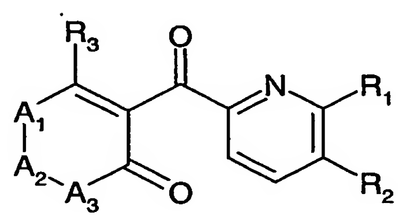
Novel herbicides

The present invention relates to novel, herbicidally active picolinoylcyclohexanediones, to processes for their preparation, to compositions comprising those compounds, and to their use in controlling weeds, especially in crops of useful plants, or in inhibiting plant growth.

Certain herbicidally active derivatives of picolinic acids disubstituted in the 3,5-position are known, such as, for example from EP-A-0 316 491, the 3,5-substituted picolinoyl derivatives of 1,3-cyclohexanediones substituted in the 2-position.

It has now been found that picolinoylcyclohexanediones that are substituted in the 5,6-position of the pyridine and unsubstituted in the 3,4-position of the pyridine exhibit excellent herbicidal and growth-inhibiting properties.

The present invention accordingly relates to compounds of formula I


(I),

wherein

R_1 is $-L_{10}-R_4$, $-L_{11}-X_1-R_5$, $-NR_6R_7$, $-X_2-R_8$ or $-X_3-L_1-R_9$;

L_2, L_4, L_6 and L_8 are each independently of the others C_1-C_4alkylene which may be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy and to which C_1-C_4alkylene group there may additionally be spirocyclically bound a C_2-C_5alkylene group, and wherein that C_2-C_5alkylene group may in turn be interrupted once or twice by oxygen, sulfur, sulfinyl or by sulfonyl and/or substituted by C_1-C_4alkyl or by C_1-C_4alkoxy;

L_3, L_5, L_7 and L_9 are each independently of the others C_1-C_4alkylene which may be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy;

R_2 is halogen, C_1-C_4haloalkyl, cyano, C_1-C_3haloalkoxy, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl, C_1-C_4alkylsulfonyl, C_1-C_4haloalkylthio, C_1-C_4haloalkylsulfinyl or C_1-C_4haloalkylsulfonyl;

L_{10} is a direct bond or a C_1-C_6alkylene, C_2-C_6alkenylene or C_2-C_6alkynylene group which may be substituted once, twice or three times by C_1-C_6alkyl, halogen, hydroxy, C_1-C_6alkoxy,

C_3-C_6cycloalkyloxy, C_1-C_6alkoxy-C_1-C_6alkoxy, C_1-C_6alkoxy-C_1-C_6alkoxy-C_1-C_6alkoxy or by C_1-C_2alkylsulfonyloxy;

R_4 is halogen, cyano, rhodano, C_1-C_6alkoxycarbonyl, C_3-C_6alkenyloxycarbonyl, C_3-C_6alkynyl-oxycarbonyl, benzyloxycarbonyl, C(O)N$R_{25a}R_{26a}$, formyl, C_1-C_6alkylcarbonyl, C_1-C_6haloalkyl-carbonyl, C_1-C_4alkoxy-C_1-C_4alkylcarbonyl, C_1-C_4alkoxy-C_1-C_4alkoxy-C_1-C_4alkylcarbonyl, N-(C_1-C_4alkyl)-C_1-C_4alkylsulfonylamino-C_1-C_4alkylcarbonyl, C_1-C_6haloalkyl, C_2-C_6alkenyl, C_2-C_6-haloalkenyl, C_2-C_6alkynyl, C_2-C_6haloalkynyl, C_3-C_6cycloalkyl, C_1-C_6alkylsulfonyloxy or phenyl-sulfonyloxy, wherein the phenyl groups may be substituted by one or more C_1-C_6alkyl, C_1-C_6-haloalkyl, C_1-C_6alkoxy, C_1-C_6haloalkoxy, halogen, cyano, hydroxy or nitro groups;

or R_4 is a three- to ten-membered, monocyclic or fused bicyclic ring system which may be aromatic, saturated or partially saturated and which may contain from 1 to 4 hetero atoms selected from nitrogen, oxygen and sulfur, and wherein the ring system may contain not more than 2 oxygen atoms and not more than two sulfur atoms, and each ring system may itself be substituted once, twice or three times by C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_4alkoxy-C_1-C_2alkyl, C_2-C_6alkenyl, C_2-C_6haloalkenyl, C_2-C_6alkynyl, C_2-C_6haloalkynyl, C_1-C_6alkoxy, hydroxy, C_1-C_6haloalkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, mercapto, C_1-C_6alkylthio, C_1-C_6haloalkylthio, C_3-C_6alkenylthio, C_3-C_6haloalkenylthio, C_3-C_6alkynylthio, C_2-C_5alkoxy-alkylthio, C_3-C_5acetylalkylthio, C_3-C_6alkoxycarbonylalkylthio, C_2-C_4cyanoalkylthio, C_1-C_6alkyl-sulfinyl, C_1-C_6haloalkylsulfinyl, C_1-C_6alkylsulfonyl, C_1-C_6haloalkylsulfonyl, aminosulfonyl, C_1-C_2alkylaminosulfonyl, di(C_1-C_2alkyl)aminosulfonyl, di(C_1-C_4alkyl)amino, halogen, cyano, nitro, phenyl or by benzylthio, and wherein phenyl and benzylthio may in turn be substituted on the phenyl ring by C_1-C_3alkyl, C_1-C_3haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, halogen, cyano or by nitro, and wherein the substituent on the nitrogen in the heterocyclic ring are other than halogen;

or R_4 is hydrogen when L_{10} is a C_1-C_6alkylene group which may be substituted once, twice or three times by C_1-C_6alkyl or by halogen; or when L_{10} is a C_2-C_6alkenylene or C_2-C_6alkynylene group which may be substituted once, twice or three times by C_1-C_6alkyl, halogen, hydroxy, C_1-C_6alkoxy, C_3-C_6cycloalkyloxy, C_1-C_6alkoxy-C_1-C_6alkoxy, C_1-C_6alkoxy-C_1-C_6alkoxy-C_1-C_6-alkoxy or by C_1-C_2alkylsulfonyloxy;

R_{25a} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substit-uted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3-haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{26a} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{25a} together with R_{26a} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3-haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

L_{11} is a C_1-C_6alkylene, C_2-C_6alkenylene or C_2-C_6alkynylene group which may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_3-C_6cycloalkyloxy, C_1-C_6-alkoxy-C_1-C_6alkoxy, C_1-C_6alkoxy-C_1-C_6alkoxy-C_1-C_6alkoxy or by C_1-C_2alkylsulfonyloxy;

X_1 is oxygen, -OC(O)-, -C(O)-, -C(=NR_{14a})-, -C(O)O-, -C(O)NR_{14b}-, -OC(O)O-, -N(R_{10})-O-, -O-NR_{11}-, thio, sulfinyl, sulfonyl, -SO_2NR_{12}-, -$NR_{13}SO_2$-, -N(SO_2R_{14c})-, -N(R_{14d})C(O)- or -NR_{14}-;

R_{10}, R_{11}, R_{12}, R_{13}, R_{14b}, R_{14d} and R_{14} are each independently of the others hydrogen, C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxycarbonyl, C_1-C_6alkylcarbonyl, C_1-C_6alkoxy-C_1-C_6alkyl, or C_1-C_6alkoxy-C_1-C_6alkyl substituted by C_1-C_6alkoxy, or benzyl or phenyl, wherein phenyl and benzyl may in turn be substituted once, twice or three times by C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxy, C_1-C_6haloalkoxy, halogen, cyano, hydroxy or by nitro;

R_{14a} is hydroxy, C_1-C_6alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy or benzyloxy;

R_{14c} is C_1-C_6alkyl;

R_5 is hydrogen or a C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl or C_3-C_6cycloalkyl group which may be substituted once, twice or three times by chlorine, bromine, iodine, hydroxy, amino, formyl, nitro, cyano, mercapto, C_1-C_6alkoxy, C_2-C_6alkenyl, C_2-C_6haloalkenyl, C_2-C_6alkynyl, C_2-C_6haloalkynyl, C_3-C_6cycloalkyl, halo-substituted C_3-C_6cycloalkyl, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6haloalkoxy, C_3-C_6haloalkenyloxy, cyano-C_1-C_6alkoxy, C_1-C_6alkoxy-C_1-C_6alkoxy, C_1-C_6alkoxy-C_1-C_6alkoxy-C_1-C_6alkoxy, C_1-C_6alkylthio-C_1-C_6alkoxy, C_1-C_6alkylsulfinyl-C_1-C_6alkoxy, C_1-C_6alkylsulfonyl-C_1-C_6alkoxy, C_1-C_6alkoxycarbonyl-C_1-C_6alkoxy, C_1-C_6alkoxycarbonyl, C_1-C_6alkylcarbonyl, phenylcarbonyl, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6alkylsulfonyl, C_1-C_6haloalkylthio, C_1-C_6haloalkylsulfinyl, C_1-C_6haloalkylsulfonyl, benzyloxy, benzylthio, benzylsulfinyl, benzylsulfonyl, C_1-C_6alkylamino, di(C_1-C_6alkyl)amino, $R_{15a}C(X_{23})N(R_{18a})$-, $R_{16a}N(R_{17a})C(X_{24})$-, $R_{16b}N(R_{17b})C(X_{25})NR_{18b}$-, $R_{15c}SO_2N(R_{18c})$-, $R_{16c}N(R_{17c})C(X_{26})O$-, $R_{15b}C(X_{27})O$-, $R_{19}R_{20}C$=NO-, $R_{15}S(O)_2O$-, $R_{16}N(R_{17})SO_2$-, rhodano, phenyl, phenoxy, phenylthio, phenylsulfinyl or by phenylsulfonyl or which may be substituted from one to seventeen times by fluorine; wherein the phenyl- or benzyl-containing groups may in turn be substituted by one or more C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxy, C_1-C_6haloalkoxy, halogen, cyano, hydroxy or nitro groups;

R_{15a}, R_{15b} and R_{15c} are hydrogen, C_1-C_6alkyl, C_2-C_6alkenyl, C_3-C_6cycloalkyl, phenyl, benzyl, C_1-C_6alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy or benzyloxy, wherein the phenyl groups may be substituted once, twice or three times by C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxy, C_1-C_6haloalkoxy, halogen, cyano, hydroxy or by nitro;

R_{16a}, R_{16b} and R_{16c} are hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl, C_3-C_6alkynyl, C_3-C_6cycloalkyl or phenyl, wherein phenyl may be substituted once, twice or three times by C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxy, C_1-C_6haloalkoxy, halogen, cyano, hydroxy or by nitro;

R_{17a}, R_{17b}, R_{17c}, R_{18a}, R_{18b} and R_{18c} are hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

X_{23}, X_{24}, X_{25}, X_{26} and X_{27} are oxygen or sulfur;

R_{15}, R_{16}, R_{17}, R_{19} and R_{20} are each independently of the others hydrogen, C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxycarbonyl, C_1-C_6alkylcarbonyl, C_1-C_6alkoxy-C_1-C_6alkyl, or C_1-C_6alkoxy-C_1-C_6alkyl substituted by C_1-C_6alkoxy, or benzyl or phenyl, wherein phenyl and benzyl may in turn be substituted once, twice or three times by C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxy, C_1-C_6haloalkoxy, halogen, cyano, hydroxy or by nitro;

or R_5 is a three- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic, saturated or partially saturated and may contain from 1 to 4 hetero atoms selected from nitrogen, oxygen and sulfur, and wherein the ring system is bound to the substituent X_1 directly or *via* a C_1-C_4alkylene, C_2-C_4alkenylene, C_2-C_4alkynylene, -N(R_{18})-C_1-C_4alkylene, -O-C_1-C_4alkylene, -S-C_1-C_4alkylene, -S(O)-C_1-C_4alkylene or -SO_2-C_1-C_4alkylene chain, wherein the ring system may not be interrupted by -C(=O)-, -C(=S)-, -C(=NR_{5a})-, -N(=O)-, -S(=O)- or by -SO_2-, and each ring system may contain not more than 2 oxygen atoms and not more than two sulfur atoms, and the ring system itself may be substituted once, twice or three times by C_1-C_6alkyl, C_1-C_6haloalkyl, C_2-C_6alkenyl, C_2-C_6haloalkenyl, C_2-C_6alkynyl, C_2-C_6haloalkynyl, C_1-C_6alkoxy, hydroxy, C_1-C_6haloalkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, mercapto, C_1-C_6alkylthio, C_1-C_6haloalkylthio, C_3-C_6alkenylthio, C_3-C_6haloalkenylthio, C_3-C_6-alkynylthio, C_2-C_5alkoxyalkylthio, C_3-C_5acetylalkylthio, C_3-C_6alkoxycarbonylalkylthio, C_2-C_4-cyanoalkylthio, C_1-C_6alkylsulfinyl, C_1-C_6haloalkylsulfinyl, C_1-C_6alkylsulfonyl, C_1-C_6haloalkyl-sulfonyl, aminosulfonyl, C_1-C_2alkylaminosulfonyl, di(C_1-C_2alkyl)aminosulfonyl, di(C_1-C_4alkyl)-amino, halogen, cyano, nitro, phenyl or by benzylthio, wherein phenyl and benzylthio may in turn be substituted on the phenyl ring by C_1-C_3alkyl, C_1-C_3haloalkyl, C_1-C_3alkoxy, C_1-C_3-haloalkoxy, halogen, cyano or by nitro, and wherein the substituents on the nitrogen in the heterocyclic ring are other than halogen;

R_{5a} is C_1-C_6alkyl, hydroxy, C_1-C_6alkoxy, cyano or nitro;

R_{18} is hydrogen, C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxycarbonyl, C_1-C_6alkylcarbonyl, C_1-C_6alkoxy-C_1-C_6alkyl, or C_1-C_6alkoxy-C_1-C_6alkyl substituted by C_1-C_6alkoxy, or benzyl or phenyl, wherein phenyl and benzyl may in turn be substituted once, twice or three times by C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxy, C_1-C_6haloalkoxy, halogen, cyano, hydroxy or by nitro;

R_6 is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl, C_3-C_6alkynyl, C_1-C_6haloalkyl, hydroxy, C_1-C_6alkoxy, -C(O)R_{19a} or -C(S)R_{20a};
R_{19a} and R_{20a} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6cycloalkyl, phenyl, benzyl, heteroaryl, C_1-C_6alkoxy, C_3-C_6alkenyloxy, benzyloxy, C_1-C_4alkylthio or a group $NR_{21}R_{22}$;
R_{21} and R_{22} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl, C_3-C_6alkynyl or phenyl, and wherein phenyl, benzyl, benzyloxy and heteroaryl in R_{19a}, R_{20a}, R_{21} and R_{22} may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
or R_{21} together with R_{22} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
or R_6 is -L_2-X_4-R_{24}; wherein
X_4 is oxygen, -NR_{23}-, -S-, -S(O)- or -S$(O)_2$-;
R_{23} is hydrogen, C_1-C_6alkoxy, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or is phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3-alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
R_{24} is hydrogen or a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-C_1-C_3alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6-alkylsulfonyl, cyano, C(X_5)$NR_{25}R_{26}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and

wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_{24} is C(O)-R_{74} or C(S)-R_{75};

X_5 is oxygen or sulfur;

R_{25} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{26} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{25} together with R_{26} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_6 is -L_3-R_{27};

R_{27} is formyl, C_1-C_6alkylcarbonyl, C_3-C_6cycloalkylcarbonyl, benzoyl, C_1-C_6alkoxycarbonyl, cyano, C(X_6)N$R_{28}R_{29}$, phenyl or heteroaryl, wherein benzoyl and phenyl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

and wherein heteroaryl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro or by C_1-C_4alkoxycarbonyl;

or R_{27} is C_3-C_6cycloalkyl or C_5-C_6cycloalkenyl each of which may in turn be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy;

X_6 is oxygen or sulfur;

R_{28} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{29} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{28} together with R_{29} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_7 is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl, C_3-C_6alkynyl, C_1-C_6haloalkyl, C_3-C_6cycloalkyl, phenyl, benzyl, heteroaryl, $C(X_7)R_{30}$ or $NR_{33}R_{34}$, wherein phenyl, benzyl and heteroaryl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3-alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3halo-alkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

X_7 is oxygen or sulfur;

R_{30} is hydrogen, C_1-C_6alkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, C_1-C_6alkoxy, C_3-C_6alkenyl-oxy, benzyloxy, C_1-C_4alkylthio or a group $NR_{31}R_{32}$;

R_{31} and R_{33} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkyl-carbonylamino;

R_{32} and R_{34} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{31} together with R_{32} or R_{33} together with R_{34}, in each case with the respective N atom to which they are bonded, form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkyl-sulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonyl-amino;

or R_7 is $-L_4-X_8-R_{35}$; wherein

X_8 is oxygen, $-NR_{36}-$, -S-, -S(O)- or $-S(O)_2-$;

R_{36} is hydrogen, C_1-C_6alkoxy, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or is phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3-alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3halo-alkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{35} is hydrogen or a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-

C_1-C_3alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6-alkylsulfonyl, cyano, $C(X_9)NR_{37}R_{38}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

X_9 is oxygen or sulfur;

R_{37} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{38} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{37} together with R_{38} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_7 is $-L_5-R_{39}$;

R_{39} is formyl, C_1-C_6alkylcarbonyl, C_3-C_6cycloalkylcarbonyl, benzoyl, C_1-C_6alkoxycarbonyl, cyano, $C(X_{10})NR_{40}R_{41}$, phenyl or heteroaryl, wherein benzoyl and phenyl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

and wherein heteroaryl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro or by C_1-C_4alkoxycarbonyl;

or R_{39} is C_3-C_6cycloalkyl or C_5-C_6cycloalkenyl each of which may in turn be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy;

X_{10} is oxygen or sulfur;

R_{40} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3halo-

alkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{41} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{40} together with R_{41} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3-haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_6 and R_7 together with the nitrogen atom to which they are bonded form a carbocyclic 3- to 7-membered, saturated or partially saturated or unsaturated monocyclic or bicyclic ring system which may be interrupted once by oxygen, once by sulfur, from one to three times by nitrogen and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3-haloalkylthio, cyano, nitro or by C_1-C_4alkoxycarbonyl; wherein each ring system may not be interrupted by –C(=O)-, -C(=S)-, -C(=NR_{5a})-, -N(=O)-, -S(=O)- or by -SO_2-;

R_{5a} is C_1-C_6alkyl, hydroxy, C_1-C_6alkoxy, cyano or nitro;

X_2 is oxygen, -NR_{42}-, sulfur, -S(O)- or -S$(O)_2$-;

R_{42} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl, C_3-C_6alkynyl, C_1-C_6haloalkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, C(X_{11})R_{43} or N$R_{46}R_{47}$;

X_{11} is oxygen or sulfur;

R_{43} is hydrogen, C_1-C_6alkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, C_1-C_6alkoxy, C_3-C_6alkenyl-oxy, benzyloxy, C_1-C_4alkylthio or a group N$R_{44}R_{45}$;

R_{44} and R_{46} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkyl-carbonylamino;

R_{45} and R_{47} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{44} together with R_{45} or R_{46} together with R_{47}, in each case with the respective N atom to which they are bonded, form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkyl-

sulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_{42} is -L_6-X_{12}-R_{48}; wherein

X_{12} is oxygen, -NR_{49}-, -S-, -S(O)- or -$S(O)_2$-;

R_{49} is hydrogen, C_1-C_6alkoxy, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or is phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3-alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{48} is a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-C_1-C_3alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6alkylsulfonyl, cyano, $C(X_{13})NR_{50}R_{51}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

X_{13} is oxygen or sulfur;

R_{50} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{51} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{50} together with R_{51} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_{42} is -L_7-R_{52};

R_{52} is formyl, C_1-C_6alkylcarbonyl, C_3-C_6cycloalkylcarbonyl, benzoyl, C_1-C_6alkoxycarbonyl, cyano, $C(X_{14})NR_{53}R_{54}$, phenyl or heteroaryl, wherein benzoyl and phenyl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3halo-

alkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
and wherein heteroaryl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro or by C_1-C_4alkoxycarbonyl;
or R_{52} is C_3-C_6cycloalkyl or C_5-C_6cycloalkenyl each of which may in turn be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy;
X_{14} is oxygen or sulfur;
R_{53} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
R_{54} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;
or R_{53} together with R_{54} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3-haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
R_8 is hydrogen or a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-C_1-C_3alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6-alkylsulfonyl, cyano, $C(X_{15})NR_{55}R_{56}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, and wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
X_{15} is oxygen or sulfur;
R_{55} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{56} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{55} together with R_{56} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_8 is cyano, C(O)-R_{76} or C(S)-R_{77};

X_3 is oxygen, -NR_{57}-, sulfur, -S(O)- or -$S(O)_2$-;

R_{57} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl, C_3-C_6alkynyl, C_1-C_6haloalkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, $C(X_{16})R_{58}$ or $NR_{61}R_{62}$;

X_{16} is oxygen or sulfur;

R_{58} is hydrogen, C_1-C_6alkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, C_1-C_6alkoxy, C_3-C_6alkenyl-oxy, benzyloxy, C_1-C_4alkylthio or a group $NR_{59}R_{60}$;

R_{59} and R_{61} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkyl-carbonylamino;

R_{60} and R_{62} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{59} together with R_{60} or R_{61} together with R_{62}, in each case with the respective N atom to which they are bonded, form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkyl-sulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonyl-amino;

or R_{57} is -L_8-X_{17}-R_{63}; wherein

X_{17} is oxygen, -NR_{64}-, -S-, -S(O)- or -$S(O)_2$-;

R_{64} is hydrogen, C_1-C_6alkoxy, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or is phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3-alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3halo-alkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{63} is a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-C_1-C_3alkoxy,

C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6alkylsulfonyl, cyano, $C(X_{18})NR_{65}R_{66}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

X_{18} is oxygen or sulfur;

R_{65} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{66} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{65} together with R_{66} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_{57} is $-L_9-R_{67}$;

R_{67} is formyl, C_1-C_6alkylcarbonyl, C_3-C_6cycloalkylcarbonyl, benzoyl, C_1-C_6alkoxycarbonyl, cyano, $C(X_{19})NR_{68}R_{69}$, phenyl or heteroaryl, wherein benzoyl and phenyl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

and wherein heteroaryl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro or by C_1-C_4alkoxycarbonyl; or R_{67} is C_3-C_6cycloalkyl or C_5-C_6cycloalkenyl each of which may in turn be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy;

X_{19} is oxygen or sulfur;

R_{68} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3halo-

alkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{69} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{68} together with R_{69} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

L_1 is C_1-C_4alkylene which may be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy and to which C_1-C_4alkylene group there may be spirocyclically bound a further C_2-C_5alkylene group which may in turn be interrupted once or twice by oxygen, sulfur, sulfinyl or by sulfonyl and/or substituted by C_1-C_4alkyl or by C_1-C_4alkoxy;

or L_1 is C_1-C_4alkylene which may be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy, and wherein a carbon atom of that C_1-C_4alkylene group together with R_9 or with R_{70} forms, by means of a further C_2-C_6alkylene chain, a ring system which may additionally be interrupted once or twice by oxygen, sulfur, sulfinyl or by sulfonyl and/or substituted by C_1-C_4alkyl or by C_1-C_4alkoxy; R_9 is a group –X_{20}-R_{70}, wherein

X_{20} is oxygen, -NR_{71}-, -S-, -S(O)- or -$S(O)_2$-;

R_{71} is hydrogen or a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-C_1-C_3alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6-alkylsulfonyl, cyano, $C(X_{21})NR_{72}R_{73}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

X_{21} is oxygen or sulfur;

R_{72} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3halo-alkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{73} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;
or R_{72} together with R_{73} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
R_{70} is hydrogen or a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-C_1-C_3alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6-alkylsulfonyl, cyano, $C(X_{15a})NR_{55a}R_{56a}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, and wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
X_{15a} is oxygen or sulfur;
R_{55a} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
R_{56a} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;
or R_{55a} together with R_{56a} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
or R_{70} is C_1-C_{10}alkylideneimino, (phenyl-C_1-C_4alkylidene)imino, or phenyl, wherein phenyl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3-alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3halo-alkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
or R_{70} is cyano, C(O)-R_{78} or C(S)-R_{79};

or R_9 is formyl, C_1-C_6alkylcarbonyl, C_3-C_6cycloalkylcarbonyl, benzoyl, C_1-C_6alkoxycarbonyl, cyano, $C(X_{35})NR_{125}R_{126}$, phenyl or heteroaryl, wherein benzoyl and phenyl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
and wherein heteroaryl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro or by C_1-C_4alkoxycarbonyl;
or R_9 is C_3-C_6cycloalkyl or C_5-C_6cycloalkenyl each of which may in turn be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy;
X_{35} is oxygen or sulfur;
R_{125} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
R_{126} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;
or R_{125} together with R_{126} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
R_{74}, R_{75}, R_{76}, R_{77}, R_{78} and R_{79} are each independently of the others hydrogen, C_1-C_6alkyl, C_3-C_6cycloalkyl, phenyl, benzyl, heteroaryl, C_1-C_6alkoxy, C_3-C_6alkenyloxy, benzyloxy, C_1-C_4alkylthio or $NR_{127}R_{128}$, wherein phenyl, benzyl or heteroaryl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
R_{127} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;
R_{128} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;
or R_{127} together with R_{128} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or

substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_3 is hydroxy, O^-M^+ wherein M^+ is a metal cation or an ammonium cation, or is halogen or $S(O)_pR_{80}$, wherein

p is 0, 1 or 2;

R_{80} is C_1-C_{12}alkyl, C_2-C_{12}alkenyl, C_2-C_{12}alkynyl, C_3-C_{12}allenyl, C_3-C_{12}cycloalkyl or C_5-C_{12}-cycloalkenyl;

or R_{80} is R_{121}-C_1-C_{12}alkylene or R_{122}-C_2-C_{12}alkenylene, wherein the alkylene or alkenylene chain may be interrupted by –O-, -S-, -S(O)-, -SO_2- or by -C(O)- and/or substituted from one to five times by R_{123};

or R_{80} is phenyl which may be substituted once, twice, three times, four times or five times by R_{124};

R_{121} and R_{122} are each independently of the other halogen, cyano, rhodano, hydroxy, C_1-C_6alkoxy, C_2-C_6alkenyloxy, C_2-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6alkyl-sulfonyl, C_2-C_6alkenylthio, C_2-C_6alkynylthio, C_1-C_6alkylsulfonyloxy, phenylsulfonyloxy, C_1-C_6-alkylcarbonyloxy, benzoyloxy, C_1-C_4alkoxycarbonyloxy, C_1-C_6alkylcarbonyl, C_1-C_4alkoxy-carbonyl, benzoyl, aminocarbonyl, C_1-C_4alkylaminocarbonyl, C_3-C_6cycloalkyl, phenyl, phenoxy, phenylthio, phenylsulfinyl or phenylsulfonyl, wherein the phenyl-containing groups may in turn be substituted once, twice or three times by halogen, C_1-C_3alkyl, C_1-C_3haloalkyl, hydroxy, C_1-C_3alkoxy, C_1-C_3haloalkoxy, cyano or by nitro;

R_{123} is hydroxy, halogen, C_1-C_6alkyl, C_1-C_6alkoxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6alkylsulfonyl, cyano, carbamoyl, carboxy, C_1-C_4alkoxycarbonyl or phenyl, wherein phenyl may be substituted once, twice or three times by hydrogen, C_1-C_4alkyl, C_1-C_4halo-alkyl, C_3-C_4alkenyl, C_3-C_4alkynyl or by C_1-C_4alkoxy;

R_{124} is halogen, C_1-C_3alkyl, C_1-C_3haloalkyl, hydroxy, C_1-C_3alkoxy, C_1-C_3haloalkoxy, cyano or nitro;

A_1 is -C($R_{112}R_{113}$)- or –NR_{114}-;

A_2 is -C$(R_{115}R_{116})_m$-, -C(=O)-, -O-, -NR_{117}- or -$S(O)_q$-;

A_3 is -C($R_{118}R_{119}$)- or –NR_{120}-;

with the proviso that A_2 is other than -O- or -$S(O)_q$- when A_1 is –NR_{114}- and/or A_3 is –NR_{120};

R_{112} and R_{118} are each independently of the other hydrogen, C_1-C_4alkyl, C_2-C_4alkenyl, C_2-C_4alkynyl, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl, C_1-C_4alkylsulfonyl, C_1-C_4alkoxycarbonyl,

hydroxy, C_1-C_4alkoxy, C_3-C_4alkenyloxy, C_3-C_4alkynyloxy, hydroxy-C_1-C_4alkyl, C_1-C_4alkyl-sulfonyloxy-C_1-C_4alkyl, halogen, cyano or nitro;
R_{113} and R_{119} are each independently of the other hydrogen, C_1-C_4alkyl or C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl;
or R_{113} together with R_{112} and/or R_{119} together with R_{118} form a C_2-C_5alkylene chain which may be interrupted by -O-, -C(O)O- or by -$S(O)_r$-;
R_{114} and R_{120} are each independently of the other hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_3-C_4alkenyl, C_3-C_4alkynyl or C_1-C_4alkoxy;
R_{115} is hydrogen, hydroxy, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3hydroxyalkyl, C_1-C_4alkoxy-C_1-C_3alkyl, C_1-C_4alkylthio-C_1-C_3alkyl, C_1-C_4alkylcarbonyloxy-C_1-C_3alkyl, C_1-C_4alkylsulfonyl-oxy-C_1-C_3alkyl, tosyloxy-C_1-C_3alkyl, di(C_1-C_4alkoxy)C_1-C_3alkyl, C_1-C_4alkoxycarbonyl, formyl, C_3-C_5oxacycloalkyl, C_3-C_5thiacycloalkyl, C_3-C_4dioxacycloalkyl, C_3-C_4dithiacycloalkyl, C_3-C_4-oxathiacycloalkyl, C_1-C_4alkoxyiminomethyl, cyano, carbamoyl, C_1-C_4alkylaminocarbonyl or di(C_1-C_4alkyl)aminocarbonyl;
or R_{115} together with R_{112} or R_{113} or R_{114} or R_{116} or R_{118} or R_{119} or R_{120} or, when m is 2, also with a second R_{115} form a C_1-C_4alkylene bridge;
R_{116} is hydrogen, C_1-C_3alkyl or C_1-C_3haloalkyl;
R_{117} is hydrogen, C_1-C_3alkyl, C_1-C_3haloalkyl, C_1-C_4alkoxycarbonyl, C_1-C_4alkylcarbonyl or di-(C_1-C_4alkyl)aminocarbonyl;
m is 1 or 2; and
q and r are each independently of the other 0, 1 or 2;
and also to agronomically acceptable salts, tautomers, isomers and enantiomers of those compounds.

The alkyl groups in the substituent definitions may be straight-chained or branched and are, for example, methyl, ethyl, n-propyl, isopropyl, n-butyl, sec-butyl, isobutyl, tert-butyl, pentyl, hexyl, heptyl and octyl and branched isomers thereof. Alkoxy, alkylthio, alkenyl and alkynyl radicals are derived from the mentioned alkyl radicals. The alkenyl and alkynyl groups may be mono- or poly-unsaturated, in which case an allenyl group and a mixed alkene-alkynyl group are also included.

Alkoxy groups are accordingly methoxy, ethoxy, n-propoxy, isopropoxy, n-butoxy, sec-butoxy, isobutoxy, tert-butoxy.

Alkylthio groups and oxidised forms thereof preferably have a chain length of from 1 to 3 carbon atoms; preference is given to, for example, methylthio, ethylthio, n-propylthio and isopropylthio; especially methyl- and ethyl-thio. Alkylsulfinyl is, for example, methylsulfinyl, ethylsulfinyl, n-propylsulfinyl or isopropylsulfinyl, and alkylsulfonyl is preferably methylsulfonyl, ethylsulfonyl, propylsulfonyl or isopropylsulfonyl; preferably methylsulfonyl or ethylsulfonyl.

Halogen is generally fluorine, chlorine, bromine or iodine; preferably fluorine, chlorine or bromine. Halo-substituted alkyl groups, that is to say haloalkyl groups, preferably have a chain length of from 1 to 6 carbon atoms. C_1-C_4Haloalkyl is, for example, fluoromethyl, difluoromethyl, trifluoromethyl, chloromethyl, dichloromethyl, trichloromethyl, 2,2,2-trifluoroethyl, 2-fluoroethyl, 2-chloroethyl, pentafluoroethyl, 1,1-difluoro-2,2,2-trichloroethyl, 2,2,2-trichloroethyl, 1,1,2,2-tetrafluoroethyl, 2,2,3,3-tetrafluoropropyl, 2,2,3,3,3-pentafluoropropyl or 2,2,3,4,4,4-hexafluorobutyl; preferably fluoromethyl, difluoromethyl, difluorochloromethyl, dichlorofluoromethyl, trifluoromethyl, 2-chloroethyl, 2,2,2-trifluoroethyl, 2,2,3,3-tetrafluoropropyl or 2,2,3,3,3-pentafluoropropyl.

As haloalkenyl groups, alkenyl groups substituted once or more than once by halogen are suitable, halogen being especially fluorine or chlorine, for example 2,2-difluoro-1-methylvinyl, 3-fluoropropenyl, 3-chloropropenyl, 3-bromopropenyl, 2,3,3-trifluoropropenyl, 2,3,3-trichloropropenyl or 4,4,4-trifluoro-but-2-en-1-yl. As haloalkynyl, for example alkynyl groups substituted once or more than once by halogen are suitable, halogen being bromine or iodine or also fluorine or chlorine, for example 3-fluoropropynyl, 3-chloropropynyl, 3-bromopropynyl, 3,3,3-trifluoropropynyl or 4,4,4-trifluoro-but-2-yn-1-yl. The same is also correspondingly true for halogen in association with other definitions such as haloalkoxy, haloalkylthio, haloalkylsulfinyl, haloalkylsulfonyl or halophenyl.

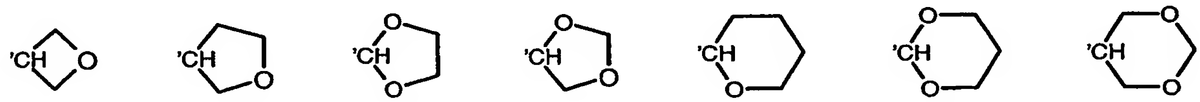
The definition of R_4 or R_5 as a three- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic, saturated or partially saturated and which may contain from 1 to 4 hetero atoms selected from nitrogen, oxygen and sulfur, and wherein the ring system may contain not more than 2 oxygen atoms and not more than two sulfur atoms, and the ring system may itself be substituted, is to be understood in the context of the present invention as meaning especially ring systems in which two oxygen atoms and/or one oxygen atom and one sulfur atom are not located next to one another, such as, for example, phenyl, naphthyl,

indenyl, cyclopentenyl, cyclohexenyl or C_3-C_8cycloalkyl, C_3-C_6oxacycloalkyl, C_2-C_5dioxacycloalkyl or similar ring systems, such as especially aromatic five- or six-membered heteroaryl groups containing from 1 to 4 hetero atoms selected from nitrogen, oxygen and sulfur, and partially or fully saturated three- to six-membered ring systems which especially contain 1 or 2 oxygen atoms, such as, for example, oxiranyl, oxetan-3-yl, tetrahydrofuran-3-yl, tetrahydropyran-2-yl, 1,3-dioxacyclopent-2-yl, 1,3-dioxacyclopent-4-yl, 1,3-dioxacyclohex-2-yl, 1,3-dioxacyclohex-5-yl or cis- and/or trans-1,3-dioxa-4,5-dimethyl-cyclopent-2-yl, or fully saturated three- to six-membered ring systems that contain 1 or 2 sulfur atoms, such as, for example, 1,3-oxathio-cyclopent-2-yl, tetrahydrothien-2-yl, 1,3-oxathio-cyclopent-2-yl or 1,3-dithiacyclopent-2-yl.

Heteroaryl, such as, for example, in the definition of R_6, R_7, R_8 or R_9 or in the case of a five- or six-membered, monocyclic or fused bicyclic, aromatic ring system R_4 or R_5, is understood to be especially an aromatic 5- or 6-membered heteroaryl group bonded *via* a carbon atom, which group may be interrupted once by oxygen, once by sulfur and/or once, twice or three times by nitrogen, for example 1-methyl-1H-pyrazol-3-yl, 1-ethyl-1H-pyrazol-3-yl, 1-propyl-1H-pyrazol-3-yl, 1H-pyrazol-3-yl, 1,5-dimethyl-1H-pyrazol-3-yl, 4-chloro-1-methyl-1H-pyrazol-3-yl, 3-isoxazolyl, 5-methyl-3-isoxazolyl, 3-methyl-5-isoxazolyl, 5-isoxazolyl, 1H-pyrrol-2-yl, 1-methyl-1H-pyrrol-2-yl, 1-methyl-1H-pyrrol-3-yl, 2-furyl, 5-methyl-2-furyl, 3-furyl, 5-methyl-2-thienyl, 2-thienyl, 3-thienyl, 1-methyl-1H-imidazol-2-yl, 1H-imidazol-2-yl, 1-methyl-1H-imidazol-4-yl, 1-methyl-1H-imidazol-5-yl, 4-methyl-2-oxazolyl, 5-methyl-2-oxazolyl, 2-oxazolyl, 2-methyl-5-oxazolyl, 2-methyl-4-oxazolyl, 4-methyl-2-thiazolyl, 5-methyl-2-thiazolyl, 2-thiazolyl, 2-methyl-5-thiazolyl, 2-methyl-4-thiazolyl, 3-methyl-4-isothiazolyl, 3-methyl-5-isothiazolyl, 5-methyl-3-isothiazolyl, 1-methyl-1H-1,2,3-triazol-4-yl, 2-methyl-2H-1,2,3-triazol-4-yl, 4-methyl-2H-1,2,3-triazol-2-yl, 1-methyl-1H-1,2,4-triazol-3-yl, 1,5-dimethyl-1H-1,2,4-triazol-3-yl, 4,5-dimethyl-4H-1,2,4-triazol-3-yl, 4-methyl-4H-1,2,4-triazol-3-yl, 5-methyl-1,2,3-oxadiazol-4-yl, 1,2,3-oxadiazol-4-yl, 3-methyl-1,2,4-oxadiazol-5-yl, 5-methyl-1,2,4-oxadiazol-3-yl, 5-methyl-1,2,3-thiadiazol-4-yl, 1,2,3-thiadiazol-4-yl, 3-methyl-1,2,4-thiadiazol-5-yl, 5-methyl-1,2,4-thiadiazol-3-yl, 4-methyl-1,2,5-thiadiazol-3-yl, 5-methyl-1,3,4-thiadiazol-2-yl, 2-pyridyl, 6-methyl-2-pyridyl, 4-pyridyl, 3-pyridyl, 6-methyl-3-pyridazinyl, 5-methyl-3-pyridazinyl, 3-pyridazinyl, 4,6-dimethyl-2-pyrimidinyl, 4-methyl-2-pyrimidinyl, 2-pyrimidinyl, 2-methyl-4-pyrimidinyl, 2-chloro-4-pyrimidinyl, 2,6-dimethyl-4-pyrimidinyl, 4-pyrimidinyl, 2-methyl-5-pyrimidinyl, 6-methyl-2-pyrazinyl, 2-pyrazinyl, 4,6-dimethyl-1,3,5-triazin-2-yl, 4,6-dichloro-1,3,5-triazin-2-yl, 1,3,5-triazin-2-yl, 4-methyl-1,3,5-triazin-2-yl, 3-methyl-1,2,4-triazin-5-yl or 3-methyl-1,2,4-

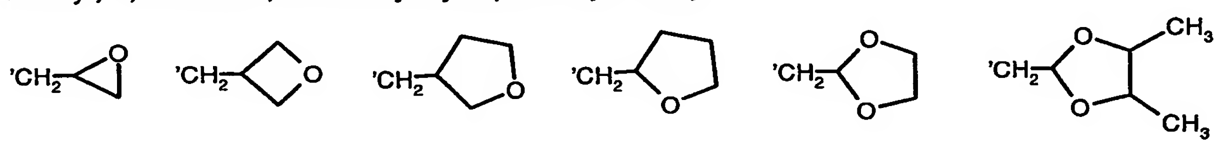
triazin-6-yl. A heteroaryl group bonded *via* the N atom is understood to be, for example, 1H-pyrrol-1-yl, 1H-pyrazol-1-yl, 3-methyl-1H-pyrazol-1-yl, 3,5-dimethyl-1H-pyrazol-1-yl, 3-trifluoromethyl-1H-pyrazol-1-yl, 3-methyl-1H-1,2,4-triazol-1-yl, 5-methyl-1H-1,2,4-triazol-1-yl or 4H-1,2,4-triazol-4-yl.

The definition of L_1 as C_1-C_4alkylene which may be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy, wherein a carbon atom of the L_1 chain forms together with R_9 a C_2-C_6alkylene chain which may be interrupted once or twice by oxygen, sulfur, sulfinyl or by sulfonyl and may be substituted by C_1-C_4alkyl or by C_1-C_4alkoxy, is to be understood in the context of the present invention as being, for example, the following cyclic C_2-C_6alkylene groups: C_3-C_6oxacycloalkyl, C_2-C_5dioxacycloalkyl, C_3-C_6oxacycloalkyl-C_1-C_2-alkyl, C_3-C_6dioxacycloalkyl-C_1-C_2alkyl or similar oxygen- or sulfur-containing groups, especially a C_3-C_6cycloalkyl group interrupted once or twice by oxygen, such as, for example, oxetan-3-yl, tetrahydrofuran-3-yl, tetrahydropyran-2-yl, 1,3-dioxacyclohex-4-yl, or



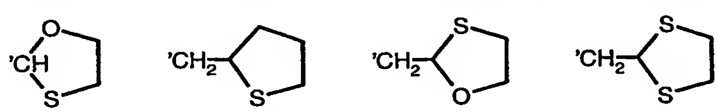
,

wherein in each case the marked 'C atom is bonded to X_3; or oxiranyl-methyl, 3-oxetanyl-methyl, tetrahydrofuran-3-yl-methyl, tetrahydrofuran-2-yl-methyl, 1,3-dioxacyclopent-3-yl-methyl, 1,3-dioxa-4,5-dimethyl-cyclopent-3-yl-methyl,



;

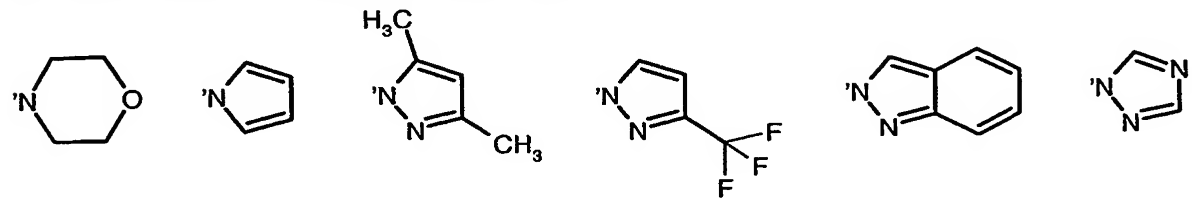
or a C_3-C_6cycloalkyl group interrupted once or twice by sulfur, e.g. 1,3-oxathio-cyclopent-2-yl, tetrahydrothien-2-yl-methyl, 1,3-oxathio-cyclopent-2-yl-methyl, 1,3-dithiacyclopent-2-yl-methyl,



etc., wherein in each case the marked 'C atom is bonded to X_1.

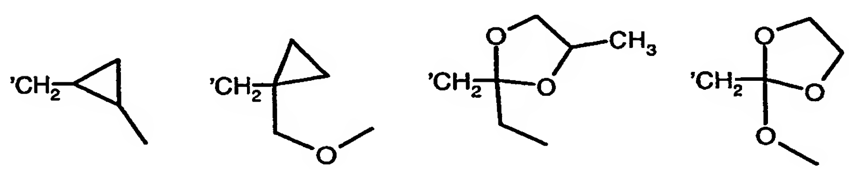
The definition of NR_6R_7 wherein R_6 together with R_7 and the common N atom forms a carbocyclic 3- to 7-membered, saturated or partially saturated monocyclic or bicyclic ring system is to be understood as meaning, for example, morpholino (=morpholin-4-yl), cis- and/or trans-2,6-dimethylmorpholin-4-yl, thiomorpholin-4-yl, N-methyl-piperidin-1-yl, 1H-pyrrol-1-yl, 1H-pyrazol-1-yl, 3-methyl-1H-pyrazol-1-yl, 3,5-dimethyl-1H-pyrazol-1-yl, 3-

trifluoromethyl-1H-pyrazol-1-yl, 3-methyl-1H-1,2,4-triazol-1-yl, 5-methyl-1H-1,2,4-triazol-1-yl, 4H-1,2,4-triazol-4-yl, or groups according to the formulae



etc., wherein in each case the marked 'N atom is bonded to the picolinyl group.

The definition of L_1, L_2, L_4, L_6 and L_8 as C_1-C_4alkylene, to which C_1-C_4alkylene group there may be spirocyclically bound a C_2-C_5alkylene group, is to be understood as meaning, for example, a C_1-C_3alkylene chain that contains a cyclopropyl group or that is substituted by a 1,3-dioxolan-2-yl group, such as, for example,

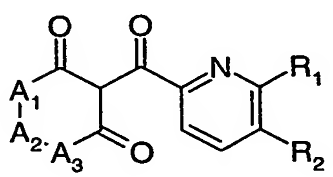


, wherein in each case the marked 'C atom represents the left-hand side valence of the definitions containing the respective substituent L. For example, in -X_3-L_1-R_9 the marked 'C atom is linked to the substituent X_3. In general, such alkylene chains, for example C_1-C_4alkylene for L_1 and L_4, can also be substituted by one or more C_1-C_3alkyl groups, especially by methyl groups. Such alkylene chains and the alkylene chains and groups interrupted by oxygen or by sulfur are preferably unsubstituted. Preferably, groups containing C_3-C_6cycloalkyl, oxiranyl, oxetanyl, C_3-C_5oxacycloalkyl, C_3-C_5thiacycloalkyl, C_3-C_4dioxacycloalkyl, C_3-C_4dithiacycloalkyl or C_3-C_4oxathiacycloalkyl and also the groups A_1, A_2 and A_3 are also unsubstituted.

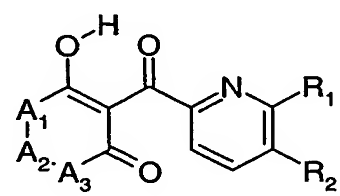
In the case that a chemical group is substituted more than once by substituents listed in a list of substituents, such as for example L_2 in the meaning of C_1-C_4alkylene which is substituted twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy, said chemical group can be substituted by different substituents from said list of substituents. The same applies *mutatis mutandis* for ring systems that are substituted more than once, such as for example R_5 in the meaning of a three- to ten-membered ring system, which is substituted twice or three times by C_1-C_6alkyl, C_1-C_6haloalkyl, C_2-C_6alkenyl, C_2-C_6haloalkenyl, C_2-C_6alkynyl, C_2-C_6haloalkynyl, C_1-C_6alkoxy, hydroxy, C_1-C_6haloalkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy,

mercapto, C_1-C_6alkylthio, C_1-C_6haloalkylthio, C_3-C_6alkenylthio, C_3-C_6haloalkenylthio, C_3-C_6-alkynylthio, C_2-C_5alkoxyalkylthio, C_3-C_5acetylalkylthio, C_3-C_6alkoxycarbonylalkylthio, C_2-C_4-cyanoalkylthio, C_1-C_6alkylsulfinyl, C_1-C_6haloalkylsulfinyl, C_1-C_6alkylsulfonyl, C_1-C_6haloalkyl-sulfonyl, aminosulfonyl, C_1-C_2alkylaminosulfonyl, di(C_1-C_2alkyl)aminosulfonyl, di(C_1-C_4alkyl)-amino, halogen, cyano, nitro, phenyl or by benzylthio.

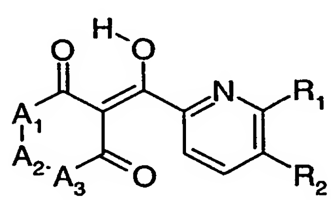
The compounds of formula I may occur in various tautomeric forms, as shown by way of example for compounds of formula I wherein R_3 is hydroxy by formulae I', I", I''' and I'''', the forms I" und I'''' being preferred as isolated forms and formula I'''' also representing a rotameric form of I".



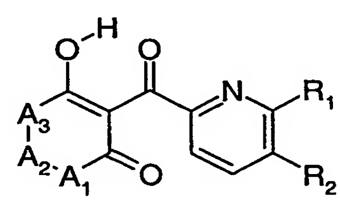
I'



I"



I'''



I''''

When there is a C=C or C=N double bond in compounds of formula I, such as, especially, in the groups R_1, the compounds of formula I may, when asymmetry exists, be in the 'E' or in the 'Z' form. If a further asymmetric centre is present, for example an asymmetric carbon atom in the group R_1, or as a result of the spatial arrangement of A_1, A_2, A_3 and the substituents R_{112}, R_{113}, R_{115}, R_{116}, R_{118} and R_{119}, chiral 'R' and 'S' forms and/or constitutional isomeric forms may also occur. The present invention accordingly includes also all those stereoisomeric and tautomeric forms of the compound of formula I.

The invention relates also to the salts which the compounds of formula I are able to form preferably with amines, alkali metal and alkaline earth metal cations or quaternary ammonium bases. Suitable salt formers are described, for example, in WO 98/41089. Among the alkali metal and alkaline earth metal hydroxides as salt formers, special mention

may be made of the hydroxides of lithium, sodium, potassium, magnesium and calcium, but especially the hydroxides of sodium and potassium.

Examples of amines suitable for ammonium salt formation include ammonia as well as primary, secondary and tertiary C_1-C_{18}alkylamines, C_1-C_4hydroxyalkylamines and C_2-C_4alkoxyalkylamines, for example methylamine, ethylamine, n-propylamine, isopropylamine, the four butylamine isomers, n-amylamine, isoamylamine, n-hexylamine, heptylamine, octylamine, nonylamine, decylamine, pentadecylamine, hexadecylamine, heptadecylamine, octadecylamine, methyl-ethylamine, methyl-isopropylamine, methyl-hexylamine, methyl-nonylamine, methyl-pentadecylamine, methyl-octadecylamine, ethyl-butylamine, ethyl-heptylamine, ethyl-octylamine, hexyl-heptylamine, hexyl-octylamine, dimethylamine, diethylamine, di-n-propylamine, diisopropylamine, di-n-butylamine, di-n-amylamine, diisoamylamine, dihexylamine, diheptylamine, dioctylamine, ethanolamine, n-propanolamine, isopropanolamine, N,N-diethanolamine, N-ethylpropanolamine, N-butylethanolamine, allylamine, n-butenyl-2-amine, n-pentenyl-2-amine, 2,3-dimethylbutenyl-2-amine, dibutenyl-2-amine, n-hexenyl-2-amine, propylenediamine, trimethylamine, triethylamine, tri-n-propylamine, triisopropylamine, tri-n-butylamine, triisobutylamine, tri-sec-butylamine, tri-n-amylamine, methoxyethylamine and ethoxyethylamine; heterocyclic amines, for example pyridine, quinoline, isoquinoline, morpholine, piperidine, pyrrolidine, indoline, quinuclidine and azepine; primary arylamines, for example anilines, methoxyanilines, ethoxyanilines, o-, m- and p-toluidines, phenylenediamines, benzidines, naphthylamines and o-, m- and p-chloroanilines; but especially triethylamine, isopropylamine and diisopropylamine.

Preferred quaternary ammonium bases suitable for salt formation correspond, for example, to the formula $[^+N(R_aR_bR_cR_d)\ ^-OH]$ wherein R_a, R_b, R_c and R_d are each independently of the others C_1-C_4alkyl. Other suitable tetraalkylammonium bases with other anions can be obtained, for example, by anion exchange reactions.

In preferred compounds of formula I:

a) A_1 is $-C(R_{112}R_{113})$-, A_2 is $-C(R_{115}R_{116})$-, A_3 is $-C(R_{118}R_{119})$-, R_{112} is hydrogen, methyl, methoxy, methylthio, methylsulfinyl, methylsulfonyl, methoxycarbonyl or ethoxycarbonyl and R_{113}, R_{115}, R_{116}, R_{118} and R_{119} are each independently of the others hydrogen or methyl; especially preferably A_1, A_2 and A_3 are unsubstituted methylene;

b) A_1 is $-C(R_{112}R_{113})-$, R_{112} together with R_{113} ethylene is a spirocyclic 3-membered ring, A_2 is $-C(R_{115}R_{116})-$, A_3 is $-C(R_{118}R_{119})-$ and R_{115}, R_{116}, R_{118} and R_{119} are each independently of the others hydrogen or methyl; especially A_2 and A_3 are unsubstituted methylene;
c) A_1 is $-C(R_{112}R_{113})-$, A_3 is $-C(R_{118}R_{119})-$, R_{112}, R_{113}, R_{118} and R_{119} are each methyl and A_2 is carbonyl or oxygen, especially carbonyl;
d) R_3 is hydroxy, O^-M^+, C_1-C_8alkylthio, C_3-C_8alkenylthio, C_3-C_8alkynylthio, benzylthio or phenylthio, especially hydroxy or a salt of formula O^-M^+ wherein M^+ is an agronomically acceptable metal cation or ammonium cation;
e) R_2 is chlorine, bromine, cyano, trifluoromethyl, difluoromethyl, difluorochloromethyl, difluoromethoxy, trifluoromethoxy, trifluoroethoxy, difluoromethylthio, trifluoromethylthio, trifluoroethylthio, methylthio, ethylthio, methylsulfonyl or ethylsulfonyl, especially trifluoromethyl;
or f) R_1 is a group $-NR_6R_7$ or a group $-X_2-R_8$ wherein X_2 is -O- or $-NR_{42}-$, or a group $-X_3-L_1-R_9$ wherein X_3 is -O- or $-NR_{57}-$.

Of those preferred compounds of formula I, special preference is given to the following compounds wherein

g) R_1 is a group $-X_3-L_1-R_9$ wherein X_3 is oxygen;
h) L_1 is a methylene or ethylene chain which may be substituted by methyl, ethyl, methoxy or by ethoxy, special emphasis being given to those compounds wherein R_1 as $-X_3-L_1-R_9$ is the side chain $-O-L_1-O-R_{70}$ wherein R_{70} is C_1-C_3alkyl, allyl, propargyl, C_1-C_2alkoxy-C_1-C_2alkyl or $C(O)-R_{78}$ and R_{78} is $NR_{127}R_{128}$;
i) R_1 as $-X_3-L_1-R_9$ is the group $-O-L_1-X_{20}-R_{70}$ wherein X_{20} is especially oxygen and a carbon atom of the chain L_1 together with R_{70} forms a C_2-C_6alkylene chain which may be interrupted once by oxygen and may be substituted once or twice by methyl;
j) R_1 is $-X_3-L_1-X_{20}-R_{70}$ wherein R_{70} is $C(O)NR_{127}R_{128}$;
k) R_1 is the group $-O-L_1-N(R_{71})C(O)R_{78}$ wherein R_{71} is especially hydrogen and R_{78} is especially C_1-C_4alkyl, cyclopropyl, phenyl, C_1-C_4alkoxy, methylamino or dimethylamino.

In a further especially preferred group of compounds that are preferred under the provisions of a) to f):
l) R_1 is a group $-NR_6R_7$ or a group $-X_3-L_1-R_9$ wherein X_3 is $-NR_{57}-$ and wherein L_1 is a methylene or ethylene chain which may be substituted by methyl, ethyl, methoxy or by ethoxy, and of that group of compounds of formula I special mention should be made of those wherein $-NR_6R_7$ is a heterocyclic group selected from morpholin-4-yl, thiomorpholinyl-

4-yl, pyrazol-1-yl and 1,2,4-triazol-1-yl, and wherein those groups may be substituted by methyl, trifluoromethyl, methoxy or by ethoxy;

m) R_1 is a group $-NR_6R_7$ wherein R_7 is $C(X_7)R_{30}$; and preferably R_6 is methyl or ethyl; X_7 is oxygen; and R_{30} is C_1-C_6alkyl, C_3-C_6cycloalkyl or phenyl.

Also preferred are compounds of formula I wherein at least one of the linking members X_3 or X_{20} is oxygen; preferably both are oxygen.

L_1 is preferably an unsubstituted C_1-C_3alkylene chain or a C_2alkylene chain substituted once by methyl.

In an outstanding group of compounds that are preferred under the provisions of a) to e):

o) R_1 is a group $-L_{11}$-X_1-R_5 wherein L_{11} is C_1-C_2alkylene which may be substituted by methyl, ethyl, methoxy or by ethoxy, especially unsubstituted methylene;

p) R_1 is a group $-L_{11}$-X_1-R_5 wherein X_1 is oxygen, -C(O)-, $-C(=NR_{14a})-$, -C(O)O-, $-C(O)NR_{14b}-$, thio, sulfonyl, $-NR_{13}SO_2-$, $-N(SO_2R_{14c})-$ or $-NR_{14}-$ wherein R_{14} is C_1-C_6alkoxycarbonyl or C_1-C_6alkylcarbonyl, X_1 being especially oxygen or $-N(SO_2R_{14c})-$;

q) R_1 is a group $-L_{11}$-X_1-R_5 wherein R_5 is C_1-C_6alkyl which may be substituted by halogen, cyano, C_1-C_4alkoxy, C_1-C_4alkoxycarbonyl, C_2-C_4alkenyl, C_2-C_4haloalkenyl, C_2-C_4alkynyl, C_3-C_6cycloalkyl, C_3-C_4alkenyloxy, C_3-C_4alkynyloxy, C_1-C_4haloalkoxy, C_3-C_4haloalkenyloxy, cyano-C_1-C_3alkoxy or by C_1-C_3alkoxy-C_1-C_3alkoxy; R_5 being especially C_1-C_4alkyl, C_3-C_4-alkenyl or C_3-C_4alkynyl, or C_1-C_3alkyl which is substituted from one to three times by fluorine, once or twice by chlorine, once or twice by methoxy or by ethoxy, once by cyano, allyloxy, propargyloxy, difluoromethoxy, trifluoromethoxy, methoxyethoxy or by C_3-C_6cycloalkyl;

r) R_1 is a group $-L_{11}$-X_1-R_5 wherein R_5 is phenyl or a three- to six-membered monocyclic ring system which may be aromatic, saturated or partially saturated and contains from 1 to 4 hetero atoms selected from nitrogen, oxygen and sulfur, wherein phenyl or the ring system is bound to the substituent X_1 directly or *via* a C_1-C_2alkylene group, and each ring system contains not more than 2 oxygen atoms and not more than two sulfur atoms, and wherein the ring system itself may be substituted from one to four times by C_1-C_3alkyl or by halogen and/or once by C_1-C_3alkoxy, C_1-C_3haloalkoxy, allyloxy, propargyloxy, C_1-C_3alkylthio or by C_1-C_3alkylsulfonyl; R_5 being especially phenyl or a three- to six-membered monocyclic, saturated ring system which contains 1 or 2 oxygen atoms, and wherein phenyl or the ring system is bound to the substituent X_1 either directly or *via* a C_1-C_2alkylene group, and

wherein preferably the ring system itself is unsubstituted or may be substituted from one to four times by C_1-C_3alkyl and/or once by methoxy or by ethoxy.

In a very especially preferred group of compounds of formula I wherein R_1 is a group $-L_{11}-X_1-R_5$

s) the bidentate linking member $-L_{11}-X_1-$ is preferably $-CH_2O-$, $-CH_2CH_2O-$ or $-CH_2N(SO_2CH_3)-$. Compounds of formula I wherein $-L_{11}-X_1-R_5$ is $CH_2OCH_2CH_2OCH_3$, $CH_2OCH_2CH_2OCH_2CH_3$, $CH_2OCH_2CF_3$, $CH_2OCH_2CH{=}CH_2$, $CH_2OCH_2C{\equiv}CH$, $CH_2OCH_2C{\equiv}CCH_3$, $CH_2OCH_2CH_2C{\equiv}CH$, $CH_2OCH_2C{\equiv}N$, $CH_2OCH_2CH_2C{\equiv}N$, $CH_2OCH_2CH_2CH_2OCH_3$, $CH_2OCH_2CH_2OCH_2CH_2OCH_3$, $CH_2OCH_2CH_2OCF_3$, $CH_2OCH_2CH_2CH_2OCF_3$, $CH_2CH_2OCH_2CH_2OCH_3$, $CH_2N(SO_2CH_3)CH_3$, $CH_2N(SO_2CH_3)CH_2CH_3$, $CH_2N(SO_2CH_3)CH_2CF_3$ or $CH_2N(SO_2CH_3)CH_2CH_2OCH_3$ are of very special interest.

In a further outstanding group of compounds that are preferred under the provisions of a) to e):

t) R_1 is a group $-L_{10}-R_4$ wherein L_{10} is a direct bond or is a C_1-C_3alkylene or C_2-C_3alkenylene group which may be substituted from one to three times by halogen, methyl, ethyl, methoxy or by ethoxy, L_{10} being especially a direct bond or an unsubstituted C_1-C_2alkylene group;

u) R_1 is a group $-L_{10}-R_4$ wherein R_4 is hydrogen, halogen, cyano or trifluoromethyl or R_4 is a three- to six-membered monocyclic ring system which may be saturated, partially saturated or aromatic and may contain 1 or 2 hetero atoms selected from nitrogen, oxygen and sulfur and may itself be substituted by methyl or methoxy or by methoxymethyl. R_1 as a group $-L_{10}-R_4$ is especially fluorine, chlorine, bromine, cyano, methyl, ethyl, n-propyl, isopropyl, cyclopropyl, trifluoromethyl, chloromethyl, bromomethyl, methoxymethyl, ethoxymethyl, dimethoxymethyl, diethoxymethyl, 1-(dimethoxy)ethyl, 1-(diethoxy)ethyl, 1-ethoxyethylene, tetrahydrofuran-2-yl, tetrahydrofuran-3-yl, 1,3-dioxolan-2-yl, 1,3-dioxolan-4-yl, (2-methyl-[1,3]dioxolan-2-yl), tetrahydropyran-2-yl, 4,5-dihydro-isoxazol-5-yl, 4,5-dihydro-isoxazol-5-yl, (3-methyl-4,5-dihydro-isoxazol-5-yl), phenyl, or phenyl substituted by halogen, methyl, trifluoromethyl, methoxy, trifluoromethoxy or by cyano.

Further groups of compounds of formula I that should be given special mention are those wherein X_1, X_2 and X_3 are sulfur, sulfinyl or sulfonyl.

In addition, very special mention should be made of a group of compounds wherein
R_1 is $-L_{11}-X_1-R_5$, $-NR_6R_7$, $-X_2-R_8$, $-X_3-L_1-R_9$, C_1-C_6haloalkyl, C_2-C_6haloalkenyl, C_2-C_6-haloalkynyl or halogen;
L_2, L_4, L_6 and L_8 are each independently of the others C_1-C_4alkylene which may be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy and to which C_1-C_4alkylene group there may additionally be spirocyclically bound a C_2-C_5alkylene group, and wherein that C_2-C_5alkylene group may in turn be interrupted once or twice by oxygen, sulfur, sulfinyl or by sulfonyl and/or substituted by C_1-C_4alkyl or by C_1-C_4alkoxy;
L_3, L_5, L_7 and L_9 are each independently of the others C_1-C_4alkylene which may be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy;
R_2 is halogen, C_1-C_4haloalkyl, cyano, C_1-C_3haloalkoxy, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl, C_1-C_4alkylsulfonyl, C_1-C_4haloalkylthio, C_1-C_4haloalkylsulfinyl or C_1-C_4haloalkylsulfonyl;
L_{11} is a C_1-C_6alkylene, C_2-C_6alkenylene or C_2-C_6alkynylene group which may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_3-C_6cycloalkyloxy, C_1-C_6-alkoxy-C_1-C_6alkoxy, C_1-C_6alkoxy-C_1-C_6alkoxy-C_1-C_6alkoxy or by C_1-C_2alkylsulfonyloxy;
X_1 is oxygen, -OC(O)-, -C(O)-, $-C(=NR_{14a})-$, -C(O)O-, $-C(O)NR_{14b}-$, -OC(O)O-, $-N(R_{10})-O-$, $-O-NR_{11}-$, thio, sulfinyl, sulfonyl, $-SO_2NR_{12}-$, $-NR_{13}SO_2-$, $-N(SO_2R_{14c})-$, $-N(R_{14d})C(O)-$ or $-NR_{14}-$;
R_{10}, R_{11}, R_{12}, R_{13}, R_{14b}, R_{14d} and R_{14} are each independently of the others hydrogen, C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxycarbonyl, C_1-C_6alkylcarbonyl, C_1-C_6alkoxy-C_1-C_6alkyl or C_1-C_6alkoxy-C_1-C_6alkyl substituted by C_1-C_6alkoxy, or benzyl or phenyl, wherein phenyl and benzyl may in turn be substituted once, twice or three times by C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxy, C_1-C_6haloalkoxy, halogen, cyano, hydroxy or by nitro;
R_{14a} is hydroxy, C_1-C_6alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy or benzyloxy;
R_{14c} is C_1-C_6alkyl;
R_5 is hydrogen or C_1-C_8alkyl, or is a C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl or C_3-C_6cycloalkyl group which may be substituted once, twice or three times by halogen, hydroxy, amino, formyl, nitro, cyano, mercapto, carbamoyl, C_1-C_6alkoxy, C_2-C_6alkenyl, C_2-C_6haloalkenyl, C_2-C_6alkynyl, C_2-C_6haloalkynyl, C_3-C_6cycloalkyl, halo-substituted C_3-C_6cycloalkyl, C_3-C_6-alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6haloalkoxy, C_3-C_6haloalkenyloxy, cyano-C_1-C_6alkoxy, C_1-C_6alkoxy-C_1-C_6alkoxy, C_1-C_6alkoxy-C_1-C_6alkoxy-C_1-C_6alkoxy, C_1-C_6alkylthio-C_1-C_6alkoxy, C_1-C_6alkylsulfinyl-C_1-C_6alkoxy, C_1-C_6alkylsulfonyl-C_1-C_6alkoxy, C_1-C_6alkoxycarbonyl-C_1-C_6-alkoxy, C_1-C_6alkoxycarbonyl, C_1-C_6alkylcarbonyl, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6-

alkylsulfonyl, C_1-C_6haloalkylthio, C_1-C_6haloalkylsulfinyl, C_1-C_6haloalkylsulfonyl, benzyloxy, benzylthio, benzylsulfinyl, benzylsulfonyl, C_1-C_6alkylamino, di(C_1-C_6alkyl)amino, $R_{19}R_{20}C$=NO-, $R_{15}S(O)_2O$-, $R_{16}N(R_{17})SO_2$-, rhodano, phenyl, phenoxy, phenylthio, phenylsulfinyl or by phenylsulfonyl; wherein the phenyl- or benzyl-containing groups may in turn be substituted by one or more C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxy, C_1-C_6haloalkoxy, halogen, cyano, hydroxy or nitro groups;

R_{15}, R_{16}, R_{17}, R_{19} and R_{20} are each independently of the others hydrogen, C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxycarbonyl, C_1-C_6alkylcarbonyl, C_1-C_6alkoxy-C_1-C_6alkyl, or C_1-C_6alkoxy-C_1-C_6alkyl substituted by C_1-C_6alkoxy, or benzyl or phenyl, wherein phenyl and benzyl may in turn be substituted once, twice or three times by C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxy, C_1-C_6haloalkoxy, halogen, cyano, hydroxy or by nitro;

or R_5 is a three- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic, saturated or partially saturated and may contain from 1 to 4 hetero atoms selected from nitrogen, oxygen and sulfur, and wherein the ring system is bound to the substituent X_1 directly or *via* a C_1-C_4alkylene, C_2-C_4alkenylene, C_2-C_4alkynylene, -N(R_{18})-C_1-C_4alkylene, -S(O)-C_1-C_4alkylene or -SO_2-C_1-C_4alkylene chain, wherein each ring system may not be interrupted by -C(=O)-, -C(=S)-, -C(=NR_{5a})-, -N(=O)-, -S(=O)- or by -SO_2-, and each ring system may contain not more than 2 oxygen atoms and not more than two sulfur atoms, and the ring system itself may be substituted once, twice or three times by C_1-C_6alkyl, C_1-C_6haloalkyl, C_2-C_6alkenyl, C_2-C_6haloalkenyl, C_2-C_6alkynyl, C_2-C_6haloalkynyl, C_1-C_6alkoxy, hydroxy, C_1-C_6haloalkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, mercapto, C_1-C_6alkylthio, C_1-C_6haloalkylthio, C_3-C_6alkenylthio, C_3-C_6haloalkenylthio, C_3-C_6alkynylthio, C_2-C_5alkoxyalkylthio, C_3-C_5-acetylalkylthio, C_3-C_6alkoxycarbonylalkylthio, C_2-C_4cyanoalkylthio, C_1-C_6alkylsulfinyl, C_1-C_6haloalkylsulfinyl, C_1-C_6alkylsulfonyl, C_1-C_6haloalkylsulfonyl, aminosulfonyl, C_1-C_2alkylaminosulfonyl, di(C_1-C_2alkyl)aminosulfonyl, di(C_1-C_4alkyl)amino, halogen, cyano, nitro, phenyl or by benzylthio, wherein phenyl and benzylthio may in turn be substituted on the phenyl ring by C_1-C_3alkyl, C_1-C_3haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, halogen, cyano or by nitro, and wherein the substituents on the nitrogen in the heterocyclic ring are other than halogen;

R_{5a} is C_1-C_6alkyl, hydroxy, C_1-C_6alkoxy, cyano or nitro;

R_{18} is hydrogen, C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxycarbonyl, C_1-C_6alkylcarbonyl, C_1-C_6alkoxy-C_1-C_6alkyl, or C_1-C_6alkoxy-C_1-C_6alkyl substituted by C_1-C_6alkoxy, or benzyl or phenyl, wherein phenyl and benzyl may in turn be substituted once, twice or three times by

C_1-C_6alkyl, C_1-C_6haloalkyl, C_1-C_6alkoxy, C_1-C_6haloalkoxy, halogen, cyano, hydroxy or by nitro;

R_6 is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl, C_3-C_6alkynyl, C_1-C_6haloalkyl, hydroxy, C_1-C_6alkoxy, -C(O)R_{19a} or -C(S)R_{20a};

R_{19a} and R_{20a} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, C_1-C_6alkoxy, C_3-C_6alkenyloxy, benzyloxy, C_1-C_4alkylthio or a group $NR_{21}R_{22}$;

R_{21} and R_{22} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl, C_3-C_6alkynyl or phenyl, and wherein phenyl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3-alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_{21} together with R_{22} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_6 is -L_2-X_4-R_{24}; wherein

X_4 is oxygen, -NR_{23}-, -S-, -S(O)- or -S(O)$_2$-;

R_{23} is hydrogen, C_1-C_6alkoxy, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or is phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3-alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3halo-alkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{24} is hydrogen or a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-C_1-C_3alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6-alkylsulfonyl, cyano, C(X_5)$NR_{25}R_{26}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkyl-thio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxy-carbonyl or by C_1-C_4alkylcarbonylamino;

or R_{24} is C(O)-R_{74} or C(S)-R_{75};

X_5 is oxygen or sulfur;

R_{25} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{26} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{25} together with R_{26} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3-haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_6 is -L_3-R_{27};

R_{27} is formyl, C_1-C_6alkylcarbonyl, C_3-C_6cycloalkylcarbonyl, benzoyl, C_1-C_6alkoxycarbonyl, cyano, C(X_6)N$R_{28}R_{29}$, phenyl or heteroaryl, wherein benzoyl and phenyl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

and wherein heteroaryl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro or by C_1-C_4alkoxycarbonyl;

or R_{27} is C_3-C_6cycloalkyl or C_5-C_6cycloalkenyl each of which may in turn be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy;

X_6 is oxygen or sulfur;

R_{28} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{29} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{28} together with R_{29} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_7 is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl, C_3-C_6alkynyl, C_1-C_6haloalkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, $C(X_7)R_{30}$ or $NR_{33}R_{34}$;

X_7 is oxygen or sulfur;

R_{30} is hydrogen, C_1-C_6alkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, C_1-C_6alkoxy, C_3-C_6alkenyloxy, benzyloxy, C_1-C_4alkylthio or a group $NR_{31}R_{32}$;

R_{31} and R_{33} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{32} and R_{34} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{31} together with R_{32} or R_{33} together with R_{34}, in each case with the respective N atom to which they are bonded, form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_7 is $-L_4-X_8-R_{35}$; wherein

X_8 is oxygen, $-NR_{36}-$, -S-, -S(O)- or $-S(O)_2-$;

R_{36} is hydrogen, C_1-C_6alkoxy, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or is phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{35} is hydrogen or a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-C_1-C_3alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6alkylsulfonyl, cyano, $C(X_9)NR_{37}R_{38}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkyl-

thio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxy-carbonyl or by C_1-C_4alkylcarbonylamino;

X_9 is oxygen or sulfur;

R_{37} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3halo-alkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{38} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{37} together with R_{38} and the respective N atom to which they are bonded form a carbo-cyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_7 is -L_5-R_{39};

R_{39} is formyl, C_1-C_6alkylcarbonyl, C_3-C_6cycloalkylcarbonyl, benzoyl, C_1-C_6alkoxycarbonyl, cyano, $C(X_{10})NR_{40}R_{41}$, phenyl or heteroaryl, wherein benzoyl and phenyl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3halo-alkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

and wherein heteroaryl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkyl-sulfonyl, C_1-C_3haloalkylthio, cyano, nitro or by C_1-C_4alkoxycarbonyl;

or R_{39} is C_3-C_6cycloalkyl or C_5-C_6cycloalkenyl each of which may in turn be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy;

X_{10} is oxygen or sulfur;

R_{40} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3halo-alkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{41} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{40} together with R_{41} and the respective N atom to which they are bonded form a carbo-cyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substit-uted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3-

haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_6 and R_7 together with the nitrogen atom to which they are bonded form a carbocyclic 3- to 7-membered, saturated or partially saturated or unsaturated monocyclic or bicyclic ring system which may be interrupted once by oxygen, once by sulfur, from one to three times by nitrogen and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3-haloalkylthio, cyano, nitro or by C_1-C_4alkoxycarbonyl; wherein each ring system may not be interrupted by –C(=O)-, -C(=S)-, -C(=NR_{5a})-, -N(=O)-, -S(=O)- or by -SO_2-;

R_{5a} is C_1-C_6alkyl, hydroxy, C_1-C_6alkoxy, cyano or nitro;

X_2 is oxygen, -NR_{42}-, sulfur, -S(O)- or -$S(O)_2$-;

R_{42} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl, C_3-C_6alkynyl, C_1-C_6haloalkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, $C(X_{11})R_{43}$ or $NR_{46}R_{47}$;

X_{11} is oxygen or sulfur;

R_{43} is hydrogen, C_1-C_6alkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, C_1-C_6alkoxy, C_3-C_6alkenyl-oxy, benzyloxy, C_1-C_4alkylthio or a group $NR_{44}R_{45}$;

R_{44} and R_{46} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkyl-carbonylamino;

R_{45} and R_{47} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{44} together with R_{45} or R_{46} together with R_{47}, in each case with the respective N atom to which they are bonded, form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkyl-sulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonyl-amino;

or R_{42} is -L_6-X_{12}-R_{48}; wherein

X_{12} is oxygen, -NR_{49}-, -S-, -S(O)- or -$S(O)_2$-;

R_{49} is hydrogen, C_1-C_6alkoxy, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or is phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3-

alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{48} is a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-C_1-C_3alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6alkylsulfonyl, cyano, $C(X_{13})NR_{50}R_{51}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

X_{13} is oxygen or sulfur;

R_{50} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{51} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{50} together with R_{51} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_{42} is $-L_7-R_{52}$;

R_{52} is formyl, C_1-C_6alkylcarbonyl, C_3-C_6cycloalkylcarbonyl, benzoyl, C_1-C_6alkoxycarbonyl, cyano, $C(X_{14})NR_{53}R_{54}$, phenyl or heteroaryl, wherein benzoyl and phenyl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

and wherein heteroaryl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro or by C_1-C_4alkoxycarbonyl; or R_{52} is C_3-C_6cycloalkyl

or C_5-C_6cycloalkenyl each of which may in turn be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy;

X_{14} is oxygen or sulfur;

R_{53} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{54} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{53} together with R_{54} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3-haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_8 is hydrogen or a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-C_1-C_3alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6-alkylsulfonyl, cyano, $C(X_{15})NR_{55}R_{56}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, and wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

X_{15} is oxygen or sulfur;

R_{55} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{56} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{55} together with R_{56} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy,

C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_8 is C(O)-R_{76} or C(S)-R_{77};

X_3 is oxygen, -NR_{57}-, sulfur, -S(O)- or -$S(O)_2$-;

R_{57} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl, C_3-C_6alkynyl, C_1-C_6haloalkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, C(X_{16})R_{58} or $NR_{61}R_{62}$;

X_{16} is oxygen or sulfur;

R_{58} is hydrogen, C_1-C_6alkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, C_1-C_6alkoxy, C_3-C_6alkenyloxy, benzyloxy, C_1-C_4alkylthio or a group $NR_{59}R_{60}$;

R_{59} and R_{61} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{60} and R_{62} are each independently of the other hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{59} together with R_{60} or R_{61} together with R_{62}, in each case with the respective N atom to which they are bonded, form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_{57} is -L_8-X_{17}-R_{63}; wherein

X_{17} is oxygen, -NR_{64}-, -S-, -S(O)- or -$S(O)_2$-;

R_{64} is hydrogen, C_1-C_6alkoxy, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or is phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{63} is a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-C_1-C_3alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6alkylsulfonyl, cyano, C(X_{18})$NR_{65}R_{66}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the

C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

X_{18} is oxygen or sulfur;

R_{65} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{66} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{65} together with R_{66} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_{57} is -L_9-R_{67};

R_{67} is formyl, C_1-C_6alkylcarbonyl, C_3-C_6cycloalkylcarbonyl, benzoyl, C_1-C_6alkoxycarbonyl, cyano, $C(X_{19})NR_{68}R_{69}$, phenyl or heteroaryl, wherein benzoyl and phenyl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

and wherein heteroaryl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro or by C_1-C_4alkoxycarbonyl;

or R_{67} is C_3-C_6cycloalkyl or C_5-C_6cycloalkenyl each of which may in turn be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy;

X_{19} is oxygen or sulfur;

R_{68} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{69} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{68} together with R_{69} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

L_1 is C_1-C_4alkylene which may be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy and to which C_1-C_4alkylene group there may be spirocyclically bound a further C_2-C_5alkylene group which may in turn be interrupted once or twice by oxygen, sulfur, sulfinyl or by sulfonyl and may be substituted by C_1-C_4alkyl or by C_1-C_4alkoxy;

or L_1 is C_1-C_4alkylene which may be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy, wherein a carbon atom of that C_1-C_4alkylene chain together with R_9 or with R_{70} forms a further C_2-C_6alkylene chain which may be interrupted once or twice by oxygen, sulfur, sulfinyl or by sulfonyl and may be substituted by C_1-C_4alkyl or by C_1-C_4alkoxy;

R_9 is a group $-X_{20}$-R_{70}, wherein

X_{20} is oxygen, -NR_{71}-, -S-, -S(O)- or -$S(O)_2$-;

R_{71} is a C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, which groups may be substituted once, twice or three times by halogen, hydroxy, C_1-C_6alkoxy, C_1-C_3alkoxy-C_1-C_3alkoxy, C_3-C_6alkenyloxy, C_3-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6alkylsulfonyl, cyano, $C(X_{21})NR_{72}R_{73}$, C_3-C_6cycloalkyl, phenyl, phenoxy or by 5- or 6-membered heteroaryl or heteroaryloxy, wherein heteroaryl or heteroaryloxy may in turn be interrupted once by oxygen or by sulfur or once, twice or three times by nitrogen and may be bonded to the C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group either *via* a C atom or *via* a N atom, and wherein the phenyl– and heteroaryl-containing groups may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

X_{21} is oxygen or sulfur;

R_{72} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{73} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{72} together with R_{73} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or

substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{70} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl, C_3-C_6alkynyl, C(O)-R_{78}, C(S)-R_{79} or phenyl which may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3-alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3halo-alkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

or R_9 is formyl, C_1-C_6alkylcarbonyl, C_3-C_6cycloalkylcarbonyl, benzoyl, C_1-C_6alkoxycarbonyl, cyano, C(X_{35})N$R_{125}R_{126}$, phenyl or heteroaryl, wherein benzoyl and phenyl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

and wherein heteroaryl may be substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkyl-sulfonyl, C_1-C_3haloalkylthio, cyano, nitro or by C_1-C_4alkoxycarbonyl;

or R_9 is C_3-C_6cycloalkyl or C_5-C_6cycloalkenyl each of which may in turn be substituted once, twice or three times by C_1-C_4alkyl, halogen or by C_1-C_4alkoxy;

X_{35} is oxygen or sulfur;

R_{125} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substitut-ed once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3halo-alkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{126} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{125} together with R_{126} and the respective N atom to which they are bonded form a carbo-cyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substit-uted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3-haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{74}, R_{75}, R_{76}, R_{77}, R_{78} and R_{79} are each independently of the others hydrogen, C_1-C_6alkyl, C_3-C_6cycloalkyl, phenyl, heteroaryl, C_1-C_6alkoxy, C_3-C_6alkenyloxy, C_1-C_4alkylthio or N$R_{127}R_{128}$;

R_{127} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl or phenyl which may be substit-uted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3-

haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_{128} is hydrogen, C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl;

or R_{127} together with R_{128} and the respective N atom to which they are bonded form a carbocyclic 3- to 6-membered ring which may be interrupted by oxygen or by sulfur and/or substituted once, twice or three times by halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3alkoxy, C_1-C_3-haloalkoxy, C_1-C_3alkylthio, C_1-C_3alkylsulfinyl, C_1-C_3alkylsulfonyl, C_1-C_3haloalkylthio, cyano, nitro, C_1-C_4alkoxycarbonyl or by C_1-C_4alkylcarbonylamino;

R_3 is hydroxy, O^-M^+ wherein M^+ is a metal cation or an ammonium cation, or is halogen or $S(O)_pR_{80}$ wherein R_{80} is C_1-C_{12}alkyl, C_2-C_{12}alkenyl, C_2-C_{12}alkynyl, C_3-C_{12}allenyl, C_3-C_{12}-cycloalkyl or C_5-C_{12}cycloalkenyl; and p is 0, 1 or 2;

or R_{80} is R_{121}-C_1-C_{12}alkylene or R_{122}-C_2-C_{12}alkenylene, wherein the alkylene or alkenylene chain may be interrupted by –O-, -S-, -S(O)-, $-SO_2-$ or by -C(O)- and/or substituted from one to five times by R_{123}; or R_{80} is phenyl which may be substituted once, twice, three times, four times or five times by R_{124};

R_{121} and R_{122} are each independently of the other halogen, cyano, rhodano, hydroxy, C_1-C_6alkoxy, C_2-C_6alkenyloxy, C_2-C_6alkynyloxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6alkylsulfonyl, C_2-C_6alkenylthio, C_2-C_6alkynylthio, C_1-C_6alkylsulfonyloxy, phenylsulfonyloxy, C_1-C_6alkylcarbonyloxy, benzoyloxy, C_1-C_4alkoxycarbonyloxy, C_1-C_6alkylcarbonyl, C_1-C_4-alkoxycarbonyl, benzoyl, aminocarbonyl, C_1-C_4alkylaminocarbonyl, C_3-C_6cycloalkyl, phenyl, phenoxy, phenylthio, phenylsulfinyl or phenylsulfonyl, wherein the phenyl-containing groups may in turn be substituted once, twice or three times by halogen, C_1-C_3alkyl, C_1-C_3haloalkyl, hydroxy, C_1-C_3alkoxy, C_1-C_3haloalkoxy, cyano or by nitro;

R_{123} is hydroxy, halogen, C_1-C_6alkyl, C_1-C_6alkoxy, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl, C_1-C_6alkylsulfonyl, cyano, carbamoyl, carboxy, C_1-C_4alkoxycarbonyl or phenyl, wherein phenyl may be substituted once, twice or three times by hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_3-C_4alkenyl, C_3-C_4alkynyl or by C_1-C_4alkoxy;

R_{124} is halogen, C_1-C_3alkyl, C_1-C_3haloalkyl, hydroxy, C_1-C_3alkoxy, C_1-C_3haloalkoxy, cyano or nitro;

A_1 is $-C(R_{112}R_{113})-$ or $-NR_{114}-$;

A_2 is $-C(R_{115}R_{116})_m-$, -C(=O)-, -O-, $-NR_{117}-$ or $-S(O)_q-$;

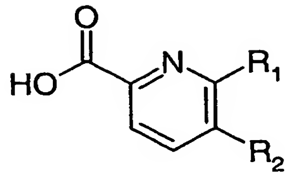
A_3 is $-C(R_{118}R_{119})-$ or $-NR_{120}-$;

with the proviso that A_2 is other than -O- or $-S(O)_q-$ when A_1 is $-NR_{114}-$ and/or A_3 is $-NR_{120}$;

R_{112} and R_{118} are each independently of the other hydrogen, C_1-C_4alkyl, C_2-C_4alkenyl, C_2-C_4alkynyl, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl, C_1-C_4alkylsulfonyl, C_1-C_4alkoxycarbonyl, hydroxy, C_1-C_4alkoxy, C_3-C_4alkenyloxy, C_3-C_4alkynyloxy, hydroxy-C_1-C_4alkyl, C_1-C_4alkyl-sulfonyloxy-C_1-C_4alkyl, halogen, cyano or nitro;
R_{113} and R_{119} are each independently of the other hydrogen, C_1-C_4alkyl or C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl;
or R_{113} together with R_{112} and/or R_{119} together with R_{118} form a C_2-C_5alkylene chain which may be interrupted by -O-, -C(O)O- or by -$S(O)_r$-;
R_{114} and R_{120} are each independently of the other hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_3-C_4alkenyl, C_3-C_4alkynyl or C_1-C_4alkoxy;
R_{115} is hydrogen, hydroxy, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_3hydroxyalkyl, C_1-C_4alkoxy-C_1-C_3alkyl, C_1-C_4alkylthio-C_1-C_3alkyl, C_1-C_4alkylcarbonyloxy-C_1-C_3alkyl, C_1-C_4alkylsulfonyl-oxy-C_1-C_3alkyl, tosyloxy-C_1-C_3alkyl, di(C_1-C_4alkoxy)C_1-C_3alkyl, C_1-C_4alkoxycarbonyl, formyl, C_3-C_5oxacycloalkyl, C_3-C_5thiacycloalkyl, C_3-C_4dioxacycloalkyl, C_3-C_4dithiacycloalkyl, C_3-C_4-oxathiacycloalkyl, C_1-C_4alkoxyiminomethyl, carbamoyl, C_1-C_4alkylaminocarbonyl or di(C_1-C_4alkyl)aminocarbonyl;
or R_{115} together with R_{112} or R_{113} or R_{114} or R_{116} or R_{118} or R_{119} or R_{120} or, when m is 2, also with a second R_{115} form a C_1-C_4alkylene bridge;
R_{116} is hydrogen, C_1-C_3alkyl or C_1-C_3haloalkyl;
R_{117} is hydrogen, C_1-C_3alkyl, C_1-C_3haloalkyl, C_1-C_4alkoxycarbonyl, C_1-C_4alkylcarbonyl or di-(C_1-C_4alkyl)aminocarbonyl;
m is 1 or 2; and
q and r are each independently of the other 0, 1 or 2;
and also Examples 1.009, 1.010, 1.033 to 1.045, 1.092, 1.097 to 1.110, 1.153 to 1.156, 1.158 to 1.169, 1.189, 1.192, 1.195 to 1.201, 2.009, 2.010, 2.033 to 2.045, 2.091, 2.096 to 2.109, 2.152 to 2.155, 2.157 to 2.168, 2.188, 2.191, 2.194 to 2.200, 3.009, 3.010, 3.033 to 3.045, 3.091, 3.096 to 3.109, 3.152 to 3.155, 3.157 to 3.168, 3.188, 3.191, 3.194 to 3.200.

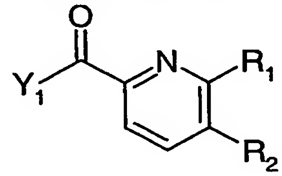
The compounds of formula I can be prepared by means of processes that are known *per se* and are described, for example, in WO 00/15615, EP-A-0 316 491, EP-A-1 352 901 and WO 02/16305.

Compounds of formula I can be prepared, for example, by
a) converting a compound of formula IIa



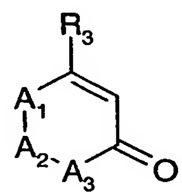
(IIa),

wherein R_1 and R_2 are as defined hereinbefore, into a compound of formula IIb



(IIb),

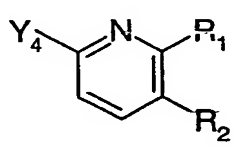
wherein Y_1 is a leaving group, e.g. halogen, cyano, acyloxy or phenoxy which may be substituted by an electron-withdrawing group, e.g. halogen, trifluoromethyl, nitro, cyano, C_1-C_4alkylcarbonyl, C_1-C_4alkoxycarbonyl or C_1-C_4alkylsulfonyl, or the like, and then reacting that compound in the presence of a base, e.g. triethylamine, Hünig's base, sodium hydrogen carbonate or potassium carbonate, with a dione of formula III



(III),

wherein A_1, A_2 and A_3 are as defined hereinbefore and R_3 is hydroxy or O^-M^+ wherein M^+ is as defined hereinbefore, and then treating the reaction mixture in the presence of the base used, e.g. triethylamine, with the aid of a cyanide-containing catalyst, e.g. acetone cyanohydrin, trimethylsilyl cyanide, copper cyanide, sodium cyanide or potassium cyanide, or by means of fluoride ions, e.g. potassium fluoride, or by means of dimethylaminopyridine; or

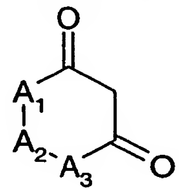
b) converting a compound of formula XIIIa



(XIIIa),

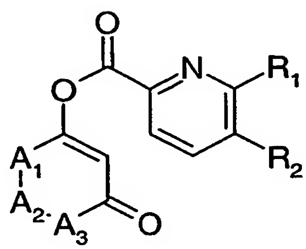
wherein R_1 and R_2 are as defined hereinbefore and Y_4 is halogen or trifluoromethanesulfonyloxy, under carbonylation conditions at elevated pressure and elevated temperature in the presence of a palladium catalyst having suitable ligands, e.g. $PdCl_2(PPh_3)_2$, $Pd(PPh_3)_4$, $Pd_2(dba)_3$, $Pd(CH_3CN)_2(PPh_3)_2$, $Pd(OAc)_2$ or (racBINAP)$PdCl_2$, and optionally in the presence of an auxiliary catalyst, e.g. triphenylphosphine, tri(tert-butyl)phosphine,

$(Ph_3)_2PCH_2CH_2P(Ph_3)_2$ or $(Ph_3)_2PCH_2CH_2CH_2P(Ph_3)_2$, and in the presence of a base, e.g. triethylamine, and optionally further adjuvants, e.g. LiCl or Li_2CO_3, using carbon monoxide and a dione of formula III or using the tautomeric form of a dione of formula IIIa



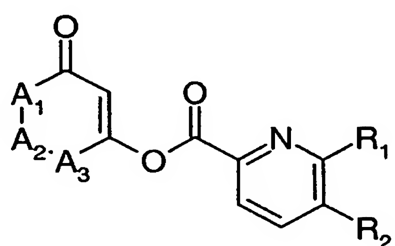
(IIIa),

wherein A_1, A_2 and A_3 are as defined hereinbefore and R_3 is hydroxy, into a compound of formula XIa



(XIa),

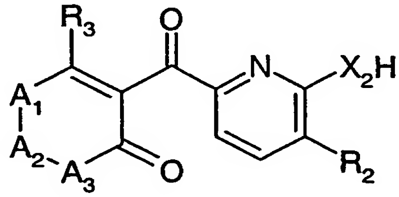
and/or its isomeric form XIb



(XIb),

wherein A_1, A_2, A_3, R_1 and R_2 are as defined hereinbefore, and then treating that compound with the aid of a cyanide-containing catalyst, e.g. acetone cyanohydrin, trimethylsilyl cyanide, copper cyanide, sodium cyanide or potassium cyanide, in the presence of a trialkylamine base, e.g. triethylamine, to obtain a compound of formula I; or

c) when X_2 or X_3 is oxygen or sulfur, reacting a compound of formula Ia



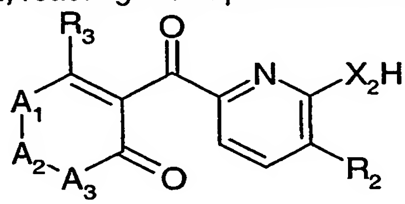
(Ia),

wherein A_1, A_2, A_3, R_2 and R_3 are as defined hereinbefore and X_2 is oxygen or sulfur, in the presence of a suitable base, e.g. potassium carbonate, anhydrous sodium hydroxide or sodium hydride, with an alkylating agent of formula IVa or IVb

$$Y_2\text{-}R_8 \quad \text{(IVa)} \quad \text{or} \quad Y_2\text{-}L_1\text{-}R_9 \quad \text{(IVb)},$$

wherein R_8 is an unsubstituted or substituted C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, and R_9 and L_1 are as defined hereinbefore, and Y_2 is a leaving group such as chlorine, bromine, iodine, mesyloxy or tosyloxy; or

d) when X_2 or X_3 is oxygen, reacting a compound of formula Ia



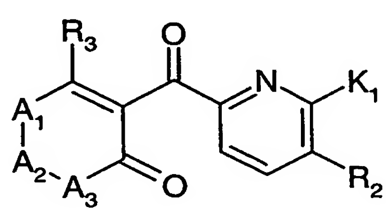
(Ia),

wherein A_1, A_2, A_3, R_2 and R_3 are as defined hereinbefore and X_2 is oxygen, in the presence of a bis-diaza-alkoxycarboxylate of formula ROC(O)-N=C=N-COOR or a bis-diazaalkyl-carbamoyl of formula RNHC(O)-N=C=N-C(O)NHR, wherein R is a C_1-C_6alkyl or C_5-C_6-cycloalkyl group, and a phosphine, e.g. triphenylphosphine or tri(tert-butyl)phosphine, with an alcohol of formula Va or Vb

$$HO\text{-}R_8 \quad \text{(Va)} \quad \text{or} \quad HO\text{-}L_1\text{-}R_9 \quad \text{(Vb)},$$

wherein R_8 is an unsubstituted or substituted C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, and R_9 and L_1 are as defined hereinbefore; or

e) reacting a compound of formula Ib



(Ib),

wherein A_1, A_2, A_3, R_2 and R_3 are as defined hereinbefore and K_1 is a leaving group, e.g. halogen or alkylsulfonyl, in the presence of a base, e.g. potassium tert-butanolate, sodium amylate, sodium hydride, dry sodium or potassium hydroxide, or an amine, e.g. triethyl-

amine, Hünig's base or dimethylaminopyridine, with an alcohol or a mercaptan of formula Vc or Vd

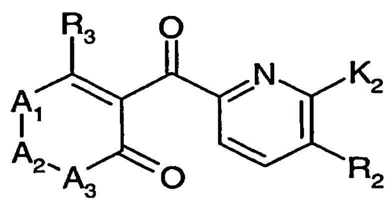
$$HX_2\text{-}R_8 \quad (Vc) \quad \text{or} \quad HX_3\text{-}L_1\text{-}R_9 \quad (Vd),$$

wherein R_8 is an unsubstituted or substituted C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, and L_1 and R_9 are as defined hereinbefore, and X_2 or X_3 is oxygen or sulfur, or with an amine of formula Ve or VI

$$HNR_{57}\text{-}L_1\text{-}R_9 \quad (Ve) \quad \text{or} \quad HNR_6R_7 \quad (VI),$$

wherein L_1, R_6, R_7, R_9 and R_{57} are as defined hereinbefore; or

f) reacting a compound of formula Ic



(Ic),

wherein A_1, A_2, A_3, R_2 and R_3 are as defined hereinbefore and K_2 is a group capable of appropriate functionalisation $-L_{10}$-K_{20}, $-L_{11}$-X_1-K_{21}, $-X_2$-K_{22}, $-X_3$-L_1-K_{23} wherein L_{10}, L_{11}, L_1, X_1, X_2 and X_3 are as defined hereinbefore and K_{20}, K_{21}, K_{22} and K_{23} are a functionalisation group, e.g. hydroxy, chlorine, bromine, iodine, mesyloxy, tosyloxy, formyl or carbonyl, either with an appropriate alkylating agent of formula VII or VIIa

$$Y_3\text{-}R_9 \quad (VII) \quad \text{or} \quad Y_3\text{-}X_{20}\text{-}R_{70} \quad (VIIa),$$

or with a ketalisation agent or a nucleophilic reagent of formula VIII

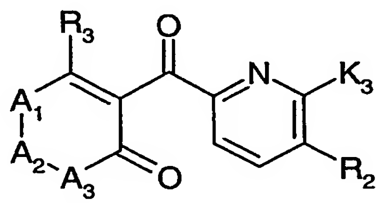
$$HX_{20}\text{-}R_{70} \quad (VIII),$$

or its salt of formula VIIIa

$$M^{+}\,{}^{-}X_{20}\text{-}R_{70} \quad (VIIIa),$$

wherein R_9, R_{70} and X_{20} are as defined hereinbefore and Y_3 is a leaving group such as bromine, iodine, tosyloxy or C_1-C_4alkylsulfonyloxy, and M^+ is a metal cation of an alkali metal base, such as lithium, sodium or potassium, optionally in the presence of an additional base, or, in the case of ketalisation of a carbonyl function, in the presence of an additional acid, e.g. p-toluenesulfonic acid, trifluoroacetic acid or sulfuric acid; or

g) when R_1 is $-L_{10}-R_4$ or $-L_{11}-X_1-R_5$ wherein L_{10} or L_{11} is especially an unsubstituted or substituted C_2-C_6alkenylene or a C_2-C_6alkynylene group and R_4, when L_{10} is a direct bond, is especially a five- to ten-membered, monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and which may contain from 1 to 4 hetero atoms selected from nitrogen, oxygen and sulfur, reacting a compound of formula Id



(Id),

wherein A_1, A_2, A_3, R_2 and R_3 are as defined hereinbefore and K_3 is a group capable of functionalisation, such as chlorine, bromine, iodine or trifluoromethylsulfonyloxy, by means of a –C-C- linking Suzuki, Stille, Sonogashira or Heck reaction, in the presence of a noble metal catalyst having suitable ligands, e.g. $PdCl_2(PPh_3)_2$, $Pd(PPh_3)_4$, $Pd_2(dba)_3$, $Pd(CH_3CN)_2(PPh_3)_2$, $Pd(OAc)_2$, Rh, Cu, CuCl or CuI, and in the presence of a base, e.g. triethylamine, Hünig's base, sodium tert-butanolate, potassium tert-butanolate, sodium carbonate, potassium carbonate, caesium carbonate, potassium fluoride or caesium fluoride, and optionally further adjuvants, e.g. LiCl or Li_2CO_3, or an additional auxiliary catalyst, e.g. triphenylphosphine, tri(tert-butyl)phosphine, $(Ph_3)_2PCH_2CH_2P(Ph_3)_2$ or $(Ph_3)_2PCH_2CH_2CH_2P(Ph_3)_2$, with a boronic acid, e.g. of formula Xa or Xb

$(HO)_2B-L_{10}-R_4$ (Xa) or $(HO)_2B-L_{11}-X_1-R_5$ (Xb),

or with a tin compound of formula Xc or Xd

$R_eR_fR_gSn-L_{10}-R_4$ (Xc) or $R_eR_fR_gSn-L_{11}-X_1-R_5$ (Xd),

or with an ethynyl compound of formula Xe or Xf having a functionality in accordance with R_1

$$H\text{-}C{\equiv}C\text{-}L_{10b}\text{-}R_4 \quad (Xe) \qquad \text{or} \qquad H\text{-}C{\equiv}C\text{-}L_{11b}\text{-}X_1\text{-}R_5 \quad (Xf),$$

or with a vinyl compound of formula Xg or Xh having a functionality in accordance with R_1

$$H\text{-}CH{=}CH\text{-}L_{10a}\text{-}R_4 \quad (Xg) \qquad \text{or} \qquad H\text{-}CH{=}CH\text{-}L_{11a}\text{-}X_1\text{-}R_5 \quad (Xh),$$

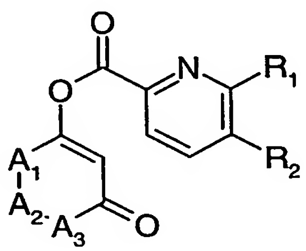
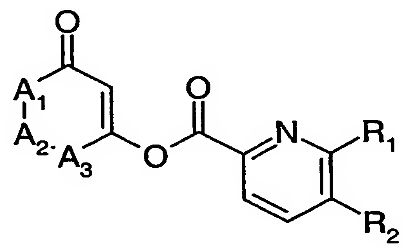
wherein L_{10}, L_{11}, R_4, R_5 and X_1 are as defined hereinbefore, R_e, R_f and R_g are each independently of the others C_1-C_8alkyl and L_{10a}, L_{10b}, L_{11a} and L_{11b} are appropriate sub-groups of the groups L_{10} and L_{11}, such as especially a direct bond or a C_1-C_4alkylene group which may be substituted once, twice or three times by C_1-C_6alkyl, halogen, hydroxy, C_1-C_6alkoxy or by C_1-C_3alkoxy-C_1-C_3alkoxy; or

h) for the preparation of compounds of formula I wherein the substituent definitions include sulfinyl or sulfonyl groups, treating a compound of formula I wherein the corresponding substituent definitions include thio groups with an oxidising agent, e.g. peracetic acid, trifluoroperacetic acid, m-chloro-perbenzoic acid, hydrogen peroxide, sodium perbromate, sodium iodate, sodium hypochloride, chlorine or bromine.

In addition, compounds of formula I wherein R_3 is other than hydroxy or halogen can be prepared, in accordance with conversion methods generally known from the literature, by nucleophilic substitution reactions of chlorides of formula I wherein R_3 is chlorine, which can be obtained from compounds of formula I wherein R_3 is hydroxy, likewise in accordance with known methods, by reaction with a chlorinating agent, such as phosgene, thionyl chloride or oxalyl chloride. In that process, for example, mercaptans, thiophenols or heterocyclic thiols are reacted in the presence of a base, for example 5-ethyl-2-methylpyridine, diisopropylethyl-amine, triethylamine, sodium hydrogen carbonate, sodium acetate or potassium carbonate. Furthermore, compounds of formula I wherein the substituent R_3 is a mercapto group can be oxidised in analogy to known standard methods, for example using peracids, e.g. meta-chloroperbenzoic acid (m-CPBA) or peracetic acid, to form the corresponding sulfoxides and/or sulfones of formula I. In the process, the degree of oxidation at the sulfur atom (-S(O)- or $-SO_2$-) can be controlled by the amount of oxidising agent.

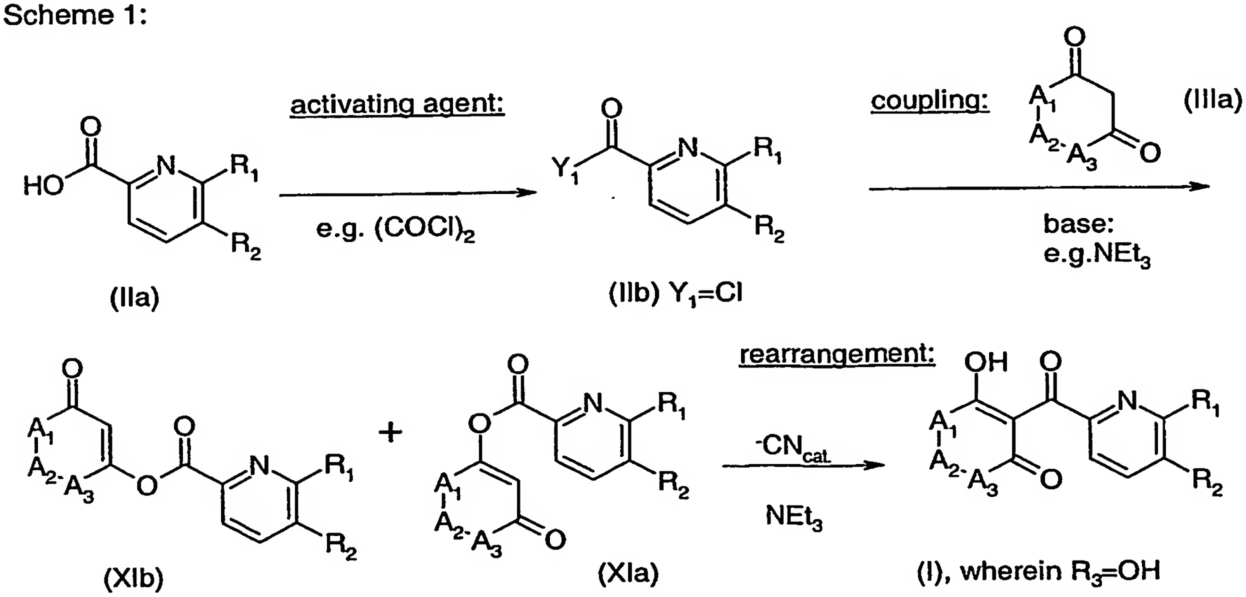
In the case of process a), as a result of reaction of a dione of formula III with an acid of formula IIa in the presence of a suitable coupling reagent, e.g. dicyclohexylcarbodiimide, N-ethyl-N'-(3-dimethylamino-propyl)-carbodiimide (EDC), 2-chloro-1-methyl-pyridinium iodide or

N,N-dimethyl-(1-chloro-2-methyl-propen)amine, or as a result of reaction of a dione of formula III with an activated form of the acid, e.g. an acid chloride, of formula IIb, wherein Y_1 is chlorine, in the presence of a base, e.g. triethylamine, Hünig's base or potassium carbonate, there is obtained a corresponding enol ester compound of formula XIa and/or XIb

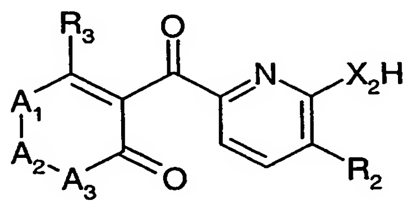

(XIa) and/or

(XIb)

wherein A_1, A_2,, A_3, R_1 and R_2 are as defined hereinbefore, which may then either be rearranged directly *in situ* by adding catalytic amounts of cyanide ions, e.g. from about 1 % to about 15 % acetone cyanohydrin, to form the compound of formula I, or may first be isolated and purified and then, in a second step, rearranged in the presence of catalytic amounts of from about 0.1 % to about 5 % potassium cyanide ions or from about 0.5 % to about 10 % acetone cyanohydrin, and a fresh amount of a trialkylamine base, e.g. from about 0.1 to about 3 equivalents of triethylamine, preferably from 1 to about 1.4 equivalents, to form the compound of formula I, as shown above using the exemplified formulae XIa and XIb to form compounds of formula I. This process may be shown in general terms in Scheme 1 using the example of the preparation of compounds of formula I.

Scheme 1:

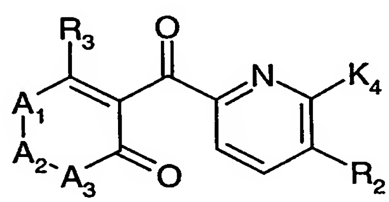


In a preferred process for the preparation of compounds of formula Ia



(Ia),

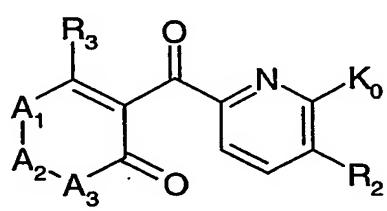
in which A_1, A_2, A_3, R_2 and R_3 are as defined hereinbefore and X_2 is oxygen or sulfur and which are used as starting materials in process variants c) and d), for example, either a compound of formula Ie



(Ie),

wherein A_1, A_2, A_3, R_2 and R_3 are as defined hereinbefore and K_4 is a cleavable group, such as methoxy when X_2 is oxygen, or is a disulfide bridge of a dimeric compound Ie, is reacted in the presence of an ether-cleaving reagent, e.g. boron trichloride, boron tribromide, aluminium chloride, sodium methylmercaptide, sodium ethylmercaptide or trimethylsilyl iodide, or a compound of formula Ie wherein K_4 is benzyloxy or dimeric disulfide is reduced catalytically in the presence of hydrogen.

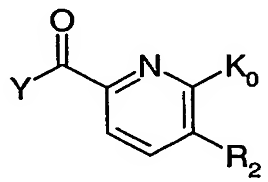
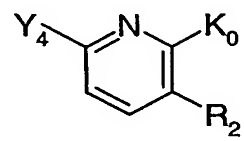
The compounds of formula If used in process variants c), d), e), f) and g)



(If)

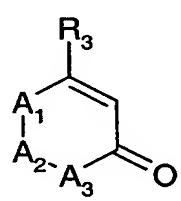
wherein A_1, A_2, A_3, R_2 and R_3 are as defined hereinbefore and K_0 is a sub-group of R_1 capable of functionalisation, as defined especially in accordance with the meanings of K_1, K_2, K_3 and/or K_4 above, such as especially fluorine, chlorine, bromine, iodine, hydroxy, methylthio, methylsulfonyl, bromomethyl, hydroxymethyl, formyl, methylcarbonyl, 2-hydroxy-

ethoxy, 2-bromoethoxy, benzyloxy or dimeric disulfide, can likewise be prepared in accordance with process variant a) or in accordance with process variant b) from the corresponding compounds of formula XII or XIII


(XII), or

(XIII),

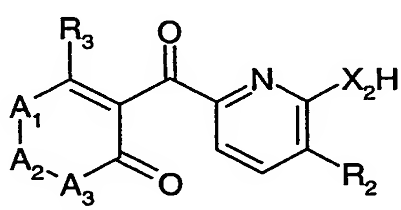
wherein K_0, R_2 and Y_4 are as defined hereinbefore; Y is C_1-C_4alkoxy, benzyloxy, hydroxy, fluorine, chlorine, cyano or phenoxy which may be substituted by an electron-withdrawing group, e.g. halogen, trifluoromethyl, nitro, cyano, C_1-C_4alkylcarbonyl, C_1-C_4alkoxycarbonyl or C_1-C_4alkylsulfonyl, Y being especially C_1-C_4alkoxy, benzyloxy, hydroxy, chlorine or cyano; and K_0 being especially hydroxy (corresponding to formula Ia wherein X_2 is oxygen), K_1 wherein K_1 is, for example, halogen or methylsulfonyl (corresponding to formula Ib), K_3 wherein K_3 is, for example, chlorine, bromine or iodine (corresponding to formula Id), K_4 wherein K_4 is, for example, methylthio, benzyloxy or methoxy (corresponding to formula Ie), or a disulfide bridge of a dimeric compound XII or XIII (corresponding to formula Ie wherein X_2 is sulfur),

aa) by reacting the compound in question with a dione of formula III


(III),

wherein R_3 is hydroxy or O^-M^+ and A_1, A_2, A_3 and M^+ are as defined hereinbefore, or

bb) by reacting a hydroxy or mercapto compound of formula Ia


(Ia),

wherein A_1, A_2, A_3, R_2 and R_3 are as defined hereinbefore and X_2 is oxygen or sulfur, in accordance with process variant c) with an appropriate alkylating agent of formula IVc

$$Y_2\text{-}L_1\text{-}K_{23} \quad \text{(IVc)},$$

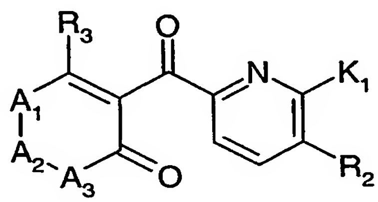
or

cc) in accordance with process variant d) with the appropriate alcohol of formula Vf

$$HO\text{-}L_1\text{-}K_{23} \qquad (Vf),$$

or

dd) in accordance with process variant e) by treating a compound of formula Ib



(Ib),

wherein A_1, A_2, A_3, R_2 and R_3 are as defined hereinbefore and K_1 is halogen or alkylsulfonyl, with an alcohol or mercaptan of formula Vg or Vh

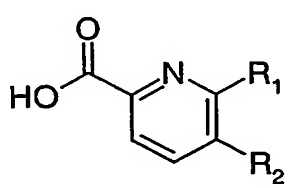
$$HK_1 \quad (Vg) \quad \text{or} \quad HX_3\text{-}L_1\text{-}K_{23} \qquad (Vh),$$

or with an amine of formula VIc

$$HNR_6\text{-}L_1\text{-}K_{23} \qquad (VIc),$$

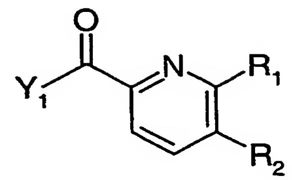
wherein K_1 is methoxy or methylthio and X_3 is oxygen or sulfur, and K_{23}, L_1, R_6 and Y_2 are as defined hereinbefore.

The starting materials of formula IIa



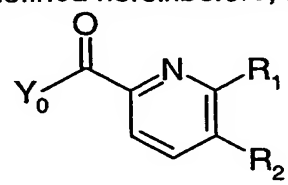
(IIa),

and of formula IIb



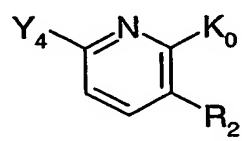
(IIb),

wherein R_1, R_2 and Y_1 are as defined hereinbefore, and also compounds of formula IId



(IId),

wherein Y_0 is C_1-C_4alkoxy, benzyloxy or phenoxy which may be unsubstituted or substituted by an electron-withdrawing group such as halogen, trifluoromethyl, nitro, cyano, C_1-C_4alkyl-carbonyl, C_1-C_4alkoxycarbonyl or C_1-C_4alkylsulfonyl, which are used as starting materials in the preparation of compounds of formula IIa, can be prepared analogously to known methods, as described e.g. in EP-A-0 353 187, by converting a compound of formula XIII

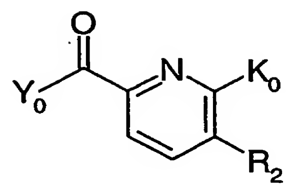


(XIII),

wherein R_2 is as defined hereinbefore, K_0 is hydrogen, methoxy, methylthio, methylsulfonyl, halogen or another group R_1 that is stable in this process, and Y_4 is chlorine, bromine or trifluoromethylsulfonyloxy, under carbonylation conditions at elevated pressure and elevated temperatures in the presence of a palladium catalyst having suitable ligands, e.g. $PdCl_2(PPh_3)_2$, $Pd(PPh_3)_4$, $Pd(CH_3CN)_2(PPh_3)_2$, $Pd_2(dba)_3$, $Pd(OAc)_2$ or (racBINAP)$PdCl_2$, and optionally in the presence of an auxiliary catalyst, e.g. triphenylphosphine, tri(tert-butyl)-phosphine, $(Ph_3)_2PCH_2CH_2P(Ph_3)_2$ or $(Ph_3)_2PCH_2CH_2CH_2P(Ph_3)_2$, and in the presence of a base, e.g. triethylamine, using carbon monoxide and an alcohol of formula IX

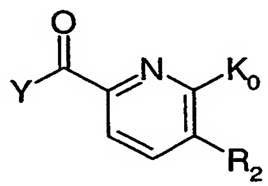
R_0-OH (IX)

wherein R_0 is C_1-C_4alkyl, benzyl or phenyl which may be unsubstituted or substituted by an electron-withdrawing group such as halogen, trifluoromethyl, nitro, cyano, C_1-C_4alkyl-carbonyl, C_1-C_4alkoxycarbonyl or C_1-C_4alkylsulfonyl, into a compound of formula XIIa



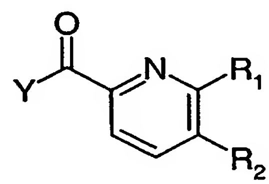
(XIIa),

wherein K_0, R_2 and Y_0 are as defined hereinbefore, and then converting that compound in known conversion reactions, e.g. hydrolysis, addition and/or substitution reactions and subsequent hydrolysis, into the compound of formula XII



(XII),

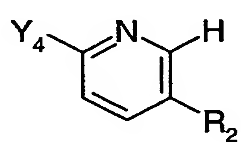
or of formula II



(II),

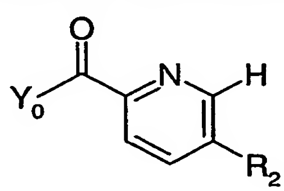
wherein K_0, R_1 and R_2 are as defined hereinbefore and Y is C_1-C_4alkoxy, benzyloxy, hydroxy, fluorine, chlorine, bromine, cyano or phenoxy which may be unsubstituted or substituted by an electron-withdrawing group, e.g. halogen, trifluoromethyl, nitro, cyano, C_1-C_4alkyl-carbonyl, C_1-C_4alkoxycarbonyl or C_1-C_4alkylsulfonyl.

For example, a compound of formula XIIIb



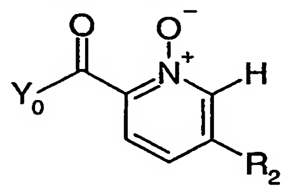
(XIIIb),

wherein R_2 and Y_4 are as defined hereinbefore, can be converted by carbonylation or by means of a *Grignard* reaction and CO_2 into a compound of formula XIIb



(XIIb),

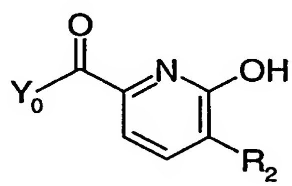
wherein R_2 and Y_0 are as defined hereinbefore, which is then converted in the presence of an oxidising agent, e.g. hydrogen peroxide or the hydrogen peroxide/urea adduct in the presence of trifluoroacetic anhydride, into an N-oxido compound of formula XV



(XV),

wherein R_2 and Y_0 are as defined hereinbefore, which is then either

a) reacted in the presence of phosphorus oxychloride or trifluoroacetic anhydride to form a hydroxy compound of formula XIIc



(XIIc),

or

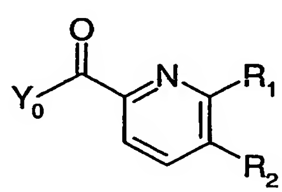
b) when a suitable nucleophile of formula Vi is used

$$HR_1 \qquad (Vi)$$

or when a nucleophile of formula VIb is used

$$HNR_6C(O)R_{30} \qquad (VIb),$$

wherein R_1, R_6, R_{30} are as defined hereinbefore, converted in the presence of an activating reagent, e.g. oxalyl chloride or trifluoroacetic anhydride, and optionally in the presence of an acid-binding agent, e.g. triethylamine or Hünig's base, directly into the compounds of formula IId



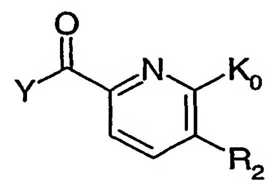
(IId),

wherein R_1, R_2 and Y_0 are as defined hereinbefore and R_1 is especially a group $-NR_4C(O)R_{30}$, which can then be converted in accordance with a) for the isolation of an intermediate of formula XIIc by known and general conversion methods such as

halogenation, e.g. by means of dichlorophenyl phosphate, further nucleophilic reactions with alcohols, mercaptans or amines of formula

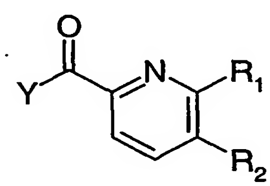
HX_3-L_1-R_9 (V) or HNR_6R_7 (VI),

wherein X_3, L_1, R_6, R_7, R_9 are as defined hereinbefore, as described above under process conditions c) to h) into compounds of formula XII



(XII),

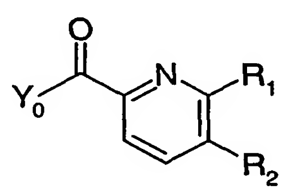
or of formula II



(II),

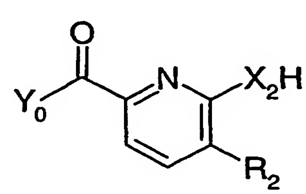
wherein K_0, R_1, R_2 and Y are as defined hereinbefore.

The starting materials of formula IId



(IId),

wherein R_1 is a group $-X_2$-R_8 or -X_3–L_1-R_9, X_2 and X_3 are oxygen, and L_1, R_2, R_9 and Y_0 are as defined hereinbefore, and R_8 is an unsubstituted or substituted C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, can also be prepared either by treating a compound of formula XIId

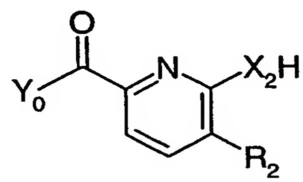


(XIId),

wherein R_2 and Y_0 are as defined hereinbefore, and X_2 is oxygen or sulfur, in accordance with process variant c) in the presence of a suitable base with an alkylating agent of formula

$$Y_2\text{-}R_8 \quad \text{(IVa)} \quad \text{or} \quad Y_2\text{-}L_1\text{-}R_9 \quad \text{(IVb)},$$

wherein L_1, R_9 and Y_2 are as defined hereinbefore and R_8 is an unsubstituted or substituted C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group; or
by reacting a compound of formula XIId



(XIId),

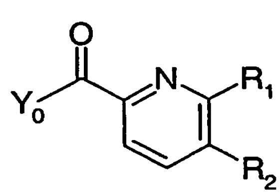
wherein R_2 and Y_0 are as defined hereinbefore and X_2 is oxygen, in accordance with process variant d) simultaneously in the presence of a bis-diaza-alkoxycarboxylate of formula ROC(O)-N=C=N-COOR or a bis-diaza-alkylcarbamoyl of formula RNHC(O)-N=C=N-C(O)NHR, wherein R is a C_1-C_6alkyl or C_5-C_6cycloalkyl group, and in the presence of a phosphine, e.g. triphenylphosphine or tri(tert-butyl)phosphine, with an alcohol of formula

$$HO\text{-}R_8 \quad \text{(Va)} \quad \text{or} \quad HO\text{-}L_1\text{-}R_9 \quad \text{(Vb)},$$

wherein R_8 is an unsubstituted or substituted C_1-C_6alkyl, C_3-C_6alkenyl or C_3-C_6alkynyl group, and R_9 and L_1 are as defined hereinbefore, respectively.

The reaction described in accordance with process variant d) is generally known as a *Mitsunobu* reaction and is especially suitable for the preparation of those compounds of formulae I and IId wherein R_1 is a group $-X_2$-R_8, $-X_3$–L_1-R_9 or $-X_1$-L_1-X_{20}-R_{70} and X_2 and X_3 are oxygen and R_8 and L_1 are a C_1-C_4alkylene group branched in the *alpha*-position or substituted in that position by halogen or by alkoxy, or together with R_9 or with R_{70} forms, by means of a further C_2-C_6alkylene chain, a 3- to 6-membered ring system.

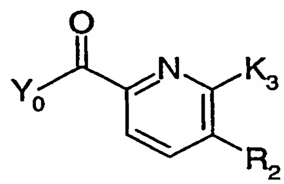
Furthermore, the starting materials of formula IId



(IId),

wherein R_1 is a group $-L_{10}$-R_4 or $-L_{11}$–X_1-R_5 and wherein L_{10} and L_{11} are especially an unsubstituted or substituted C_2-C_6alkenylene or a C_2-C_6alkynylene group and R_4, when L_{10} is

a direct bond, is especially a three- to ten-membered, monocyclic or fused bicyclic ring system which may be aromatic or partially saturated, and which may contain from 1 to 4 hetero atoms selected from nitrogen, oxygen and sulfur, and R_2, R_5, X_1 and Y_0 are as defined hereinbefore, can advantageously be prepared by reacting a compound of formula XIIe



(XIIe)

wherein R_2 and Y_0 are as defined hereinbefore, and K_3 is group capable of further functionalisation, such as chlorine, bromine, iodine or trifluoromethylsulfonyloxy, in accordance with process variant g) by means of a -C-C- linking *Suzuki*, *Stille*, *Sonogashira* or *Heck* reaction, in the presence of a noble metal catalyst having suitable ligands, e.g. $PdCl_2(PPh_3)_2$, $Pd(PPh_3)_4$, $Pd_2(dba)_3$, $Pd(CH_3CN)_2(PPh_3)_2$, $Pd(OAc)_2$, Rh, Cu, CuCl or CuI, and in the presence of a base, e.g. triethylamine, Hünig's base, sodium tert-butanolate, potassium tert-butanolate, sodium carbonate, potassium carbonate, caesium carbonate, potassium fluoride or caesium fluoride, and optionally further adjuvants, e.g. LiCl or Li_2CO_3, or an additional auxiliary catalyst, e.g. triphenylphosphine, tri(tert-butyl)phosphine, $(Ph_3)_2PCH_2CH_2P(Ph_3)_2$ or $(Ph_3)_2PCH_2CH_2CH_2P(Ph_3)_2$, with a boronic acid, e.g. of formula Xa or Xb

$(HO)_2B\text{-}L_{10}\text{-}R_4$ (Xa) or $(HO)_2B\text{-}L_{11}\text{-}X_1\text{-}R_5$ (Xb),

or with a tin compound of formula Xc or Xd

$R_aR_bR_cSn\text{-}L_{10}\text{-}R_4$ (Xc) or $R_aR_bR_cSn\text{-}L_{11}\text{-}X_1\text{-}R_5$ (Xd),

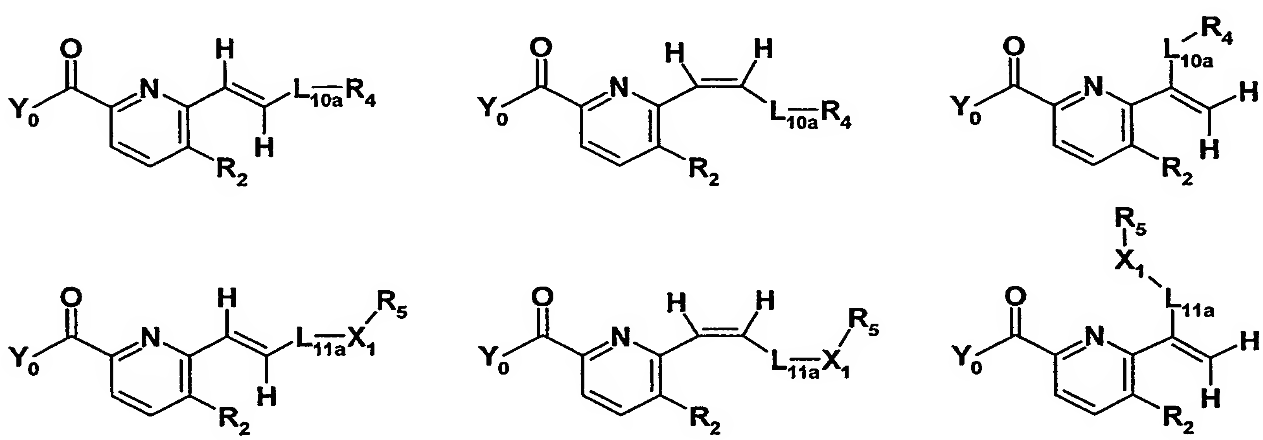
or with an ethynyl compound of formula Xe or Xf having a functionality in accordance with R_1

$H\text{-}C{\equiv}C\text{-}L_{10b}\text{-}R_4$ (Xe) or $H\text{-}C{\equiv}C\text{-}L_{11b}\text{-}X_1\text{-}R_5$ (Xf),

or with a vinyl compound of formula Xg or Xh having a functionality in accordance with R_1

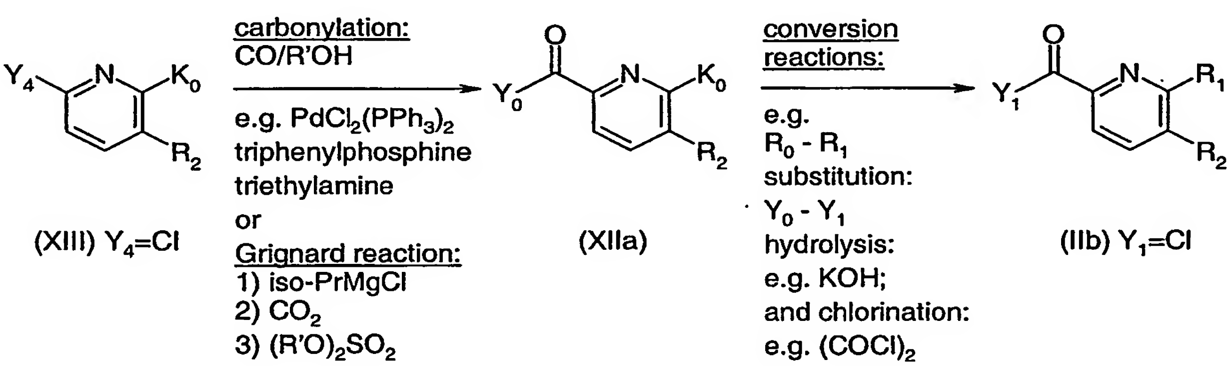
$H\text{-}CH{=}CH\text{-}L_{10a}\text{-}R_4$ (Xg) or $H\text{-}CH{=}CH\text{-}L_{11a}\text{-}X_1\text{-}R_5$ (Xh),

wherein L_{10}, L_{11}, R_4, R_5 and X_1 are as defined hereinbefore, R_a, R_b and R_c are each independently of the others C_1-C_8alkyl and L_{10a}, L_{10b}, L_{11a} and L_{11b} are appropriate sub-groups of the groups L_{10} and L_{11}, such as especially a direct bond or a C_1-C_4alkylene group which may be substituted once, twice or three times by C_1-C_6alkyl, halogen, hydroxy, C_1-C_6alkoxy or by C_1-C_3alkoxy-C_1-C_3alkoxy, and wherein the reagents Xg and Xh can each result in one or more regio-isomeric products, for example

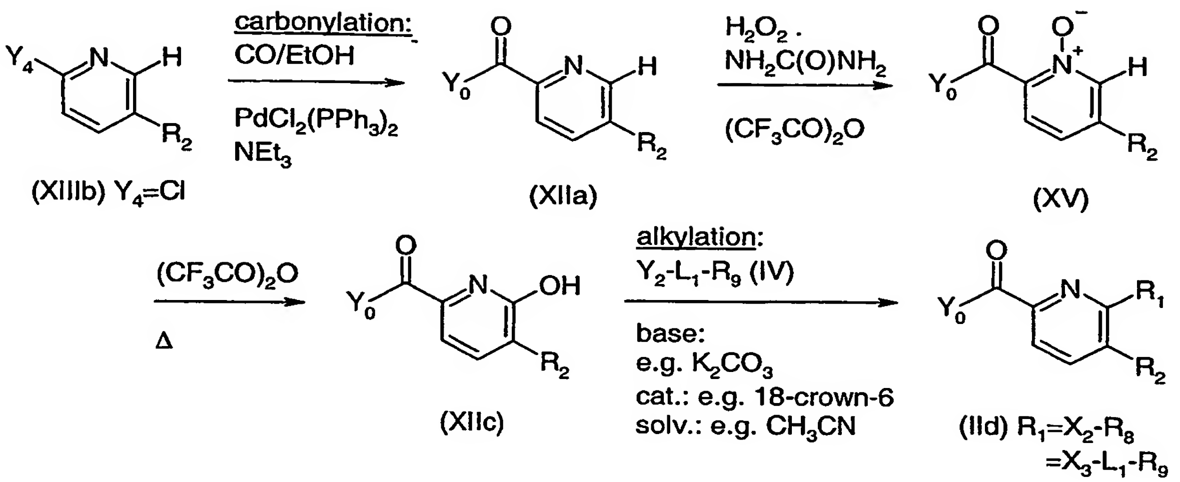


Those process sequences are described in greater detail in Reaction schemes 2 to 5 below.

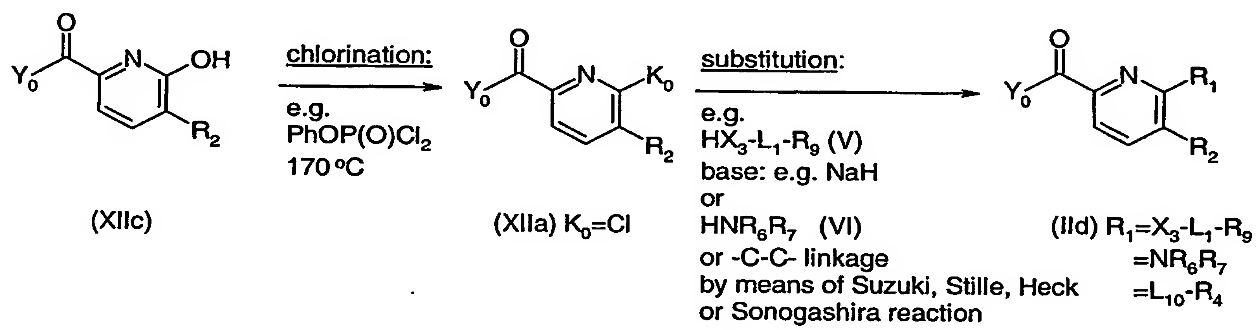
Reaction scheme 2:



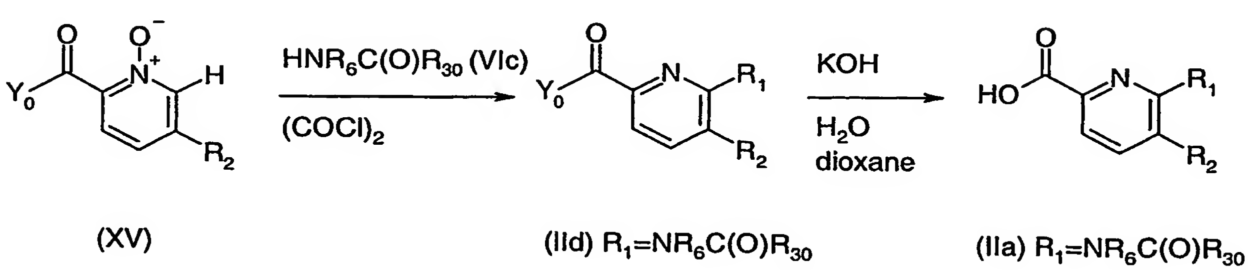
Reaction scheme 3:



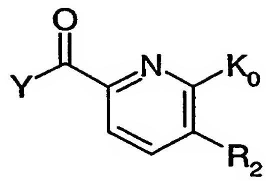
Reaction scheme 4:



Reaction scheme 5:

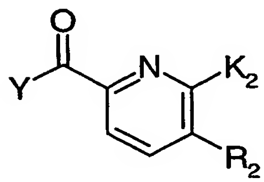


The compounds of formula XII



(XII)

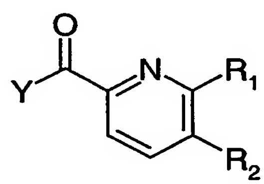
and XIIf



(XIIf),

wherein K_0, K_2 and R_2 are as defined hereinbefore and Y is accordingly Y_0, hydroxy or Y_1, which are used as starting materials in the preparation of compounds of general formulae If and especially Ic, can likewise be prepared in accordance with the generally known methods or in accordance with the preparation processes c) to h) given above for formulae I and IIc.

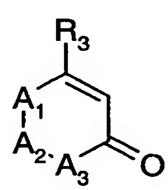
The compounds of formula II used as starting materials



(II),

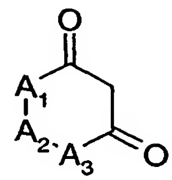
wherein R_1 and R_2 are as defined hereinbefore and Y is C_1-C_4alkoxy, benzyloxy, hydroxy, fluorine, chlorine, bromine, cyano or phenoxy which may be unsubstituted or substituted by an electron-withdrawing group, e.g. halogen, trifluoromethyl, nitro, cyano, C_1-C_4alkyl-carbonyl, C_1-C_4alkoxycarbonyl or C_1-C_4alkylsulfonyl, are novel and the present Application relates also to the use thereof in the preparation of compounds of formula I. In compounds of formula II, Y is preferably C_1-C_4alkoxy, benzyloxy, hydroxy, chlorine or cyano.

The compounds of formula III used as starting materials are generally known. For example, diones of formula III



(III),

and of formula IIIa



(IIIa),

wherein A_1, A_2 and A_3 are as defined hereinbefore and R_3 is hydroxy or O^-M^+ wherein M^+ is as defined hereinbefore, are known, for example, from DE-A-3902818, WO 00/39094, or they can be prepared in accordance with the methods described therein.

The starting materials of formulae IVa, IVb, IVc, V, Va, Vb, Vc, Vd, Ve, Vf, Vg, Vh, Vi, VI, VIa, VIb, VIc, VII, VIIa, VIII, VIIIa, IX, Xa, Xb, Xc, Xd, Xe, Xf, Xg, Xh, XIIIa, XIIIb are likewise generally known or they can be prepared analogously to known methods.

All the reactions according to the preparation processes a) to h) for forming compounds of formula I and also intermediates of formula II are advantageously carried out in aprotic and inert organic solvents. Such solvents are hydrocarbons, e.g. benzene, toluene, xylene or cyclohexane, chlorinated hydrocarbons, e.g. dichloromethane, chloroform, tetrachloromethane or chlorobenzene, ethers, e.g. diethyl ether, ethylene glycol dimethyl ether, diethylene glycol dimethyl ether, tetrahydrofuran or dioxane, nitriles, e.g. acetonitrile or propionitrile, and amides, e.g. N,N-dimethylformamide, diethylformamide or N-methylpyrrolidinone. The temperatures in those reactions are preferably from -20°C to +120°C. When the reactions are exothermic, they can usually be carried out at room temperature. In order to shorten the reaction time or also in order to initiate the reaction, the reaction mixture may, where appropriate, be heated briefly up to its boiling point. Relatively new application techniques such as ultrasound and the use of microwaves are also highly suitable. It is often possible, especially when using microwaves, for the reaction times to be substantially reduced at relatively mild temperatures of from about 100°C to about 150°C. The reaction times can likewise be shortened by adding a suitable base as reaction catalyst. Suitable bases are, especially, tertiary amines such as trimethylamine, triethylamine, quinuclidine, 1,4-diazabicyclo[2.2.2]octane, 1,5-diazabicyclo[4.3.0]non-5-ene and 1,5-diazabicyclo[5.4.0]-undec-7-ene. However, it is also possible to use inorganic bases, such as hydrides, e.g. sodium or calcium hydride, hydroxides, e.g. dry sodium or potassium hydroxide, carbonates, e.g. sodium or potassium carbonate, or hydrogen carbonates, e.g. sodium or potassium hydrogen carbonate.

In accordance with process a), preparation of the compounds of formulae I, If, and II, IIb and XII, wherein Y_1 and Y are chlorine, is carried out using a chlorinating agent, e.g. oxalyl

chloride, thionyl chloride, phosgene, (1-chloro-2-methyl-propenyl)-dimethyl-amine, phosphorus pentachloride, phosphorus oxychloride or dichlorophosphate, preferably using oxalyl chloride. The reaction is preferably carried out in an inert, organic solvent, for example in an aliphatic, halogenated aliphatic, aromatic or halogenated aromatic hydrocarbon, e.g. n-hexane, benzene, toluene, xylenes, dichloromethane, 1,2-dichloroethane or chlorobenzene, at reaction temperatures in the range from -20°C up to the reflux temperature of the reaction mixture, preferably at about 40-100°C, and in the presence of a catalytic amount of N,N-dimethylformamide. It can also, where appropriate, be carried out directly in the chlorinating agent used, without additional solvent.

The end products of formula I can be isolated in conventional manner by concentrating or evaporating off the solvent and can be separated and purified by recrystallising or by triturating the solid residue in solvents in which they are not readily soluble, such as ethers, aromatic hydrocarbons or chlorinated hydrocarbons, or by distillation or by means of column chromatography or by means of HPLC techniques using a suitable eluant.

The person skilled in the art will also be familiar with the order in which the reactions should be performed in order to avoid subsidiary reactions as far as possible. Unless synthesis is specifically aimed at the isolation of pure isomers, the product may be obtained in the form of a mixture of two or more isomers, e.g. chiral centres in the case of alkyl groups or cis/trans isomerism in the case of alkenyl groups or 'E' or 'Z' forms. All those isomers can be separated using methods known *per se*, e.g. chromatography or fractional crystallisation, or, by specifically controlling the reactions, a desired form can be produced in a relatively high concentration or in pure form.

The compounds of formula I according to the invention can be used as herbicides in unmodified form, that is to say as obtained in the synthesis, but they are generally formulated in various ways, using formulation adjuvants such as carriers, solvents and surface-active substances, to form herbicidal compositions. The formulations can be in various physical forms, e.g. in the form of dusting powders, gels, wettable powders, water-dispersible granules, water-dispersible tablets, effervescent tablet compacts, emulsifiable concentrates, micro-emulsifiable concentrates, oil-in-water emulsions, aqueous dispersions, dispersions in oil, suspoemulsions, water-soluble concentrates (having water or a water-miscible organic solvent as carrier), impregnated polymer films, or in other forms that are known, for example from the Manual on Development and Use of FAO Specifications for Plant Protection Products, 5th Edition, 1999. Those formulations either can be used directly

or are diluted before use. The dilutions can be produced using, for example, water, liquid fertilisers, micro-nutrients, biological organisms, oil or solvents.

The formulations can be produced, for example, by mixing the active ingredient with the formulation adjuvants to obtain compositions in the form of finely divided solids, granules, spherules, solutions, dispersions or emulsions. The active ingredients can also be formulated with other adjuvants, such as finely divided solids, mineral oils, organic solvents, water, surface-active substances or combinations thereof. The active ingredients can also be contained in very fine microcapsules consisting of a polymer. Microcapsules contain the active ingredients in a porous carrier. This enables active ingredients to be released into the surroundings in controlled amounts. Microcapsules usually have a diameter of from 0.1 to 500 microns. They contain active ingredient in an amount of about from 25 to 95 % by weight of the capsule weight. The active ingredients can be present in the form of a monolithic solid, in the form of fine particles in solid or liquid dispersion or in the form of a suitable solution. The encapsulating membranes comprise, for example, natural and synthetic gums, cellulose, styrene-butadiene copolymers, polyacrylonitrile, polyacrylate, polyester, polyamides, polyureas, polyurethane or chemically modified polymers and starch xanthates or other polymers known in this context to the person skilled in the art. Alternatively, it is possible for very fine microcapsules to be formed wherein the active ingredient is present in the form of finely divided particles in a solid matrix of a base substance, but in that case the microcapsules are not encapsulated.

The formulation adjuvants that are suitable for producing the compositions according to the invention are known *per se*. As liquid carriers there may be used: water, toluene, xylene, petroleum ether, vegetable oils, acetone, methyl ethyl ketone, cyclohexanone, acid anhydrides, acetonitrile, acetophenone, amyl acetate, 2-butanone, chlorobenzene, cyclohexane, cyclohexanol, alkyl esters of acetic acid, diacetone alcohol, 1,2-dichloropropane, diethanolamine, p-diethylbenzene, diethylene glycol, diethylene glycol abietate, diethylene glycol butyl ether, diethylene glycol ethyl ether, diethylene glycol methyl ether, N,N-dimethylformamide, dimethyl sulfoxide, 1,4-dioxane, dipropylene glycol, dipropylene glycol methyl ether, dipropylene glycol dibenzoate, diproxitol, alkylpyrrolidinone, ethyl acetate, 2-ethylhexanol, ethylene carbonate, 1,1,1-trichloroethane, 2-heptanone, alpha-pinene, d-limonene, ethylene glycol, ethylene glycol butyl ether, ethylene glycol methyl ether, gamma-butyrolactone, glycerol, glycerol acetate, glycerol diacetate, glycerol triacetate,

hexadecane, hexylene glycol, isoamyl acetate, isobornyl acetate, isooctane, isophorone, isopropylbenzene, isopropyl myristate, lactic acid, laurylamine, mesityl oxide, methoxy-propanol, methyl isoamyl ketone, methyl isobutyl ketone, methyl laurate, methyl octanoate, methyl oleate, methylene chloride, m-xylene, n-hexane, n-octylamine, octadecanoic acid, octylamine acetate, oleic acid, oleylamine, o-xylene, phenol, polyethylene glycol (PEG400), propionic acid, propylene glycol, propylene glycol methyl ether, p-xylene, toluene, triethyl phosphate, triethylene glycol, xylenesulfonic acid, paraffin, mineral oil, trichloroethylene, perchloroethylene, ethyl acetate, amyl acetate, butyl acetate, propylene glycol monomethyl ether, diethylene glycol monomethyl ether, methanol, ethanol, isopropanol, and alcohols of higher molecular weight such as amyl alcohol, tetrahydrofurfuryl alcohol, hexanol, octanol, etc., ethylene glycol, propylene glycol, glycerol, N-methyl-2-pyrrolidinone (NMP), and the like. Water is generally the carrier of choice for dilution of the concentrates. Suitable solid carriers are, for example, talc, titanium dioxide, pyrophyllite clay, silica, attapulgite clay, kieselguhr, chalk, calcium carbonate, bentonite, calcium montmorillonite, cottonseed husks, wheat flour, soybean flour, pumice, wood flour, ground walnut shells, lignin and similar substances such as are described, for example, in CFR 180.1001. (c) & (d).

A large number of surface-active substances can advantageously be used both in solid and in liquid formulations, especially in those which can be diluted with a carrier before application. Surface-active substances can be anionic, cationic, non-ionic or polymeric, and they can be used as emulsifying agents, wetting agents or suspension agents or for other purposes. Typical surface-active substances include, for example, salts of alkyl sulfates, e.g. diethanolammonium lauryl sulfate; salts of alkylarylsulfonates, e.g. calcium dodecylbenzene-sulfonate; addition products of alkylphenols and alkylene oxides, e.g. nonylphenol ethoxylates; addition products of alcohols and alkylene oxides, e.g. tridecylalcohol ethoxylates; soaps, e.g. sodium stearate; salts of alkylnaphthalenesulfonates, e.g. sodium dibutyl-naphthalenesulfonate; dialkyl esters of sulfosuccinate salts, e.g. sodium di(2-ethylhexyl)-sulfosuccinate; sorbitol esters, e.g. sorbitol oleate; quaternary amines, e.g. lauryl trimethyl-ammonium chloride, polyethylene glycol esters of fatty acids, e.g. polyethylene glycol stearate; block copolymers of ethylene oxide and propylene oxide; and salts of mono- and di-alkyl phosphate esters; and also further substances described, for example, in "McCutcheon's Detergents and Emulsifiers Annual" MC Publishing Corp., Ridgewood New Jersey, 1981.

Further adjuvants which can usually be used in herbicidal formulations include crystallisation inhibitors, viscosity-modifying substances, suspension agents, dyes, antioxidants, foaming agents, light-absorbing agents, mixing adjuvants, anti-foams, complex-formers, neutralising or pH-modifying substances and buffers, corrosion inhibitors, fragrances, wetting agents, take-up enhancers, micro-nutrients, plasticisers, glidants, lubricants, dispersants, thickening agents, antifreeze agents, microbicidal agents, and also liquid and solid fertilisers.

The formulations may also comprise additional active substances, e.g. further herbicides, herbicide safeners, plant growth regulators, fungicides and/or insecticides.

The compositions according to the invention may additionally include an additive comprising an oil of vegetable or animal origin, a mineral oil, alkyl esters thereof or mixtures of such oils and oil derivatives. The amounts of oil additive used in the composition according to the invention are generally from 0.01 to 10 %, based on the spray mixture. For example, the oil additive can be added to the spray tank in the desired concentration after the spray mixture has been prepared. Preferred oil additives comprise mineral oils or an oil of vegetable origin, for example rapeseed oil, olive oil or sunflower oil, emulsified vegetable oil, such as AMIGO® (Rhône-Poulenc Canada Inc.), alkyl esters of oils of vegetable origin, for example the methyl derivatives, or an oil of animal origin, such as fish oil or beef tallow. A preferred additive e.g. NOV233 contains as active components essentially 80 % by weight alkyl esters of fish oils and 15 % by weight methylated rapeseed oil, and also 5 % by weight of customary emulsifiers and pH modifiers.

Especially preferred oil additives comprise alkyl esters of C_8-C_{22} fatty acids, the methyl derivatives of C_{12}-C_{18} fatty acids, for example the methyl esters of lauric acid, palmitic acid and oleic acid, being especially important. Those esters are known as methyl laurate (CAS-111-82-0), methyl palmitate (CAS-112-39-0) and methyl oleate (CAS-112-62-9). A preferred fatty acid methyl ester derivative is Emery® 2230 and 2231 (Cognis GmbH). These and other oil derivatives are also known from the Compendium of Herbicide Adjuvants, 5th Edition, Southern Illinois University, 2000.

The application and action of the oil additives can be further improved by combining them with surface-active substances, such as non-ionic, anionic or cationic surfactants. Examples of suitable anionic, non-ionic and cationic surfactants are listed on pages 7 and 8 of

WO 97/34485. Preferred surface-active substances are anionic surfactants of the dodecylbenzylsulfonate type, especially the calcium salts thereof, and also non-ionic surfactants of the fatty alcohol ethoxylate type. Special preference is given to ethoxylated C_{12}-C_{22} fatty alcohols having a degree of ethoxylation of from 5 to 40. Examples of commercially available surfactants are the Genapol types (Clariant AG). Also preferred are silicone surfactants, especially polyalkyl-oxide-modified heptamethyltrisiloxanes, which are commercially available, for example, as Silwet L-77®, and also perfluorinated surfactants. The concentration of surface-active substances in relation to the total additive is generally from 1 to 30 % by weight. Examples of oil additives that consist of mixtures of oils or mineral oils or derivatives thereof with surfactants are Edenor ME SU®, Turbocharge® (Zeneca Agro, CA) and Actipron® (BP Oil UK Limited, GB).

Where appropriate, the mentioned surface-active substances can also be used alone, that is to say without oil additives, in the formulations.

The addition of an organic solvent to the oil additive/surfactant mixture can also bring about a further enhancement of action. Suitable solvents are, for example, Solvesso® (ESSO) and Aromatic Solvent® (Exxon Corporation). The concentration of such solvents can be from 10 to 80 % by weight of the total weight. Such oil additives, which are present in admixture with solvents, are described, for example, in US-A-4,834,908. A commercially available oil additive known therefrom is known by the name MERGE® (BASF Corporation). A further oil additive that is preferred according to the invention is SCORE® (Syngenta Crop Protection Canada).

In addition to the oil additives listed above, it is also possible, for the purpose of enhancing the action of the compositions according to the invention, to add formulations of alkyl pyrrolidones (e.g. Agrimax®) to the spray mixture. Formulations of synthetic latices, such as, for example, polyacrylamide, polyvinyl compounds or poly-1-p-menthene (e.g. Bond®, Courier® or Emerald®), can also be used for the purpose. Solutions comprising propionic acid, for example Eurogkem Pen-e-trate®, can also be admixed as action-enhancing agents with the spray mixture.

The herbicidal formulations generally contain from 0.1 to 99 % by weight, especially from 0.1 to 95 % by weight, of compound of formula I and from 1 to 99.9 % by weight of a formulation adjuvant which preferably contains from 0 to 25 % by weight of a surface-active substance. Whereas commercial products will preferably be formulated as concentrates, the end user will normally employ dilute formulations.

The rates of application of compounds of formula I may vary within wide limits and depend on the nature of the soil, the method of application (pre- or post-emergence; seed dressing; application to the seed furrow; no tillage application etc.), the crop plant, the weed or grass to be controlled, the prevailing climatic conditions, and other factors governed by the method of application, the time of application and the target crop. The compounds of formula I according to the invention are generally applied at a rate of from 1 to 2000 g/ha.

The invention relates also to a method of selectively controlling grasses and weeds in crops of useful plants, which comprises treating the useful plants or the area of cultivation or locus thereof with the compounds of formula I.

The weeds to be controlled may be either monocotyledonous or dicotyledonous weeds, such as, for example, *Stellaria, Nasturtium, Agrostis, Digitaria, Avena, Setaria, Sinapis, Lolium, Solanum, Echinochloa, Scirpus, Monochoria, Sagittaria, Bromus, Alopecurus, Sorghum, Rottboellia, Cyperus, Abutilon, Sida, Xanthium, Amaranthus, Chenopodium, Ipomoea, Chrysanthemum, Galium, Viola* and *Veronica*.

As crops of useful plants in which the composition according to the invention can be used there come into consideration especially cereals, cotton, soybeans, sugar beet, sugar cane, plantation crops, rape, maize and rice. Crops are to be understood as including those which have been made tolerant to herbicides or classes of herbicides (e.g. ALS-, GS-, EPSPS- and HPPD-inhibitors) by means of conventional breeding or genetic engineering methods. An example of a crop that has been made tolerant by conventional breeding methods to, for example, imidazolinones such as imazamox is Clearfield® summer rape (canola). Examples of crops made tolerant to herbicides by genetic engineering methods are maize varieties resistant to, for example, glyphosate or glufosinate, which are commercially available under the trade names RoundupReady® and LibertyLink®.

Useful plants are to be understood as expressly including pest-resistant and/or fungus-resistant transgenic useful plants.

In the context of the present invention, pest-resistant transgenic crop plants are to be understood as being those which have been so transformed by the use of recombinant DNA techniques that they are capable of synthesising one or more selectively acting toxins, such as are known, for example, from toxin-producing bacteria, especially those of the genus Bacillus.

Toxins that can be expressed by such transgenic plants include, for example, insecticidal proteins, for example insecticidal proteins from Bacillus cereus or Bacillus popliae; or insecticidal proteins from Bacillus thuringiensis, such as δ-endotoxins, e.g. CryIA(b), CryIA(c), CryIF, CryIF(a2), CryIIA(b), CryIIIA, CryIIIB(b1) or Cry9c, or vegetative insecticidal proteins (VIP), e.g. VIP1, VIP2, VIP3 or VIP3A; or insecticidal proteins of bacteria-colonising nematodes, for example Photorhabdus spp. or Xenorhabdus spp., such as Photorhabdus luminescens, Xenorhabdus nematophilus; toxins produced by animals, such as scorpion toxins, arachnid toxins, wasp toxins and other insect-specific neurotoxins; toxins produced by fungi, such as Streptomycetes toxins; plant lectins, such as pea lectins, barley lectins or snowdrop lectins; agglutinins; proteinase inhibitors, such as trypsine inhibitors, serine protease inhibitors, patatin, cystatin, papain inhibitors; ribosome-inactivating proteins (RIP), such as ricin, maize-RIP, abrin, luffin, saporin or bryodin; steroid metabolism enzymes, such as 3-hydroxysteroidoxidase, ecdysteroid-UDP-glycosyl-transferase, cholesterol oxidases, ecdysone inhibitors, HMG-COA-reductase, ion channel blockers, such as blockers of sodium or calcium channels, juvenile hormone esterase, diuretic hormone receptors, stilbene synthase, bibenzyl synthase, chitinases and glucanases.

In the context of the present invention there are to be understood by δ-endotoxins, for example CryIA(b), CryIA(c), CryIF, CryIF(a2), CryIIA(b), CryIIIA, CryIIIB(b1) or Cry9c, or vegetative insecticidal proteins (VIP), for example VIP1, VIP2, VIP3 or VIP3A, expressly also hybrid toxins, truncated toxins and modified toxins. Hybrid toxins are produced recombinantly by a new combination of different domains of those proteins (see, for example, WO 02/15701). An example of a truncated toxin is a truncated CryIA(b), which is expressed in Bt11 maize of Syngenta Seeds SAS, as described hereinbelow. In the case of modified toxins, one or more amino acids of the naturally occurring toxin is/are replaced. In such

amino acid replacements, preferably non-naturally present protease recognition sequences are inserted into the toxin, such as, for example, in the case of CryIIIA055, a cathepsin-D-recognition sequence is inserted into a CryIIIA toxin (see WO 03/018810).

Examples of such toxins or transgenic plants capable of synthesising such toxins are disclosed, for example, in EP-A-0 374 753, WO 93/07278, WO 95/34656, EP-A-0 427 529, EP-A-451 878 and WO 03/052073.

The processes for the preparation of such transgenic plants are generally known to the person skilled in the art and are described, for example, in the publications mentioned above. CryI-type deoxyribonucleic acids and their preparation are known, for example, from WO 95/34656, EP-A-0 367 474, EP-A-0 401 979 and WO 90/13651.

The toxin contained in the transgenic plants provides the plants with tolerance to harmful insects. Such insects can occur in any taxonomic group of insects, but are especially commonly found in beetles (Coleoptera), two-winged insects (Diptera) and butterflies (Lepidoptera).

The following harmful insects from different taxonomic groups are especially common in maize crops:

Ostrinia nubilalis, European corn borer
Agrotis ipsilon, black cutworm
Helicoverpa zea, corn earworm
Spodoptera frugiperda, fall armyworm
Diatraea grandiosella, southwestern corn borer
Elasmopalpus lignosellus, lesser cornstalk borer
Diatraea saccharalis, sugarcane borer
Diabrotica virgifera virgifera, western corn rootworm
Diabrotica longicornis barberi, northern corn rootworm
Diabrotica undecimpunctata howardi, southern corn rootworm
Melanotus spp., wireworms
Cyclocephala borealis, northern masked chafer (white grub)
Cyclocephala immaculata, southern masked chafer (white grub)
Popillia japonica, Japanese beetle
Chaetocnema pulicaria, corn flea beetle
Sphenophorus maidis, maize billbug

Rhopalosiphum maidis, corn leaf aphid
Anuraphis maidiradicis, corn root aphid
Blissus leucopterus leucopterus, chinch bug
Melanoplus femurrubrum, red-legged grasshopper
Melanoplus sanguinipes, migratory grasshopper
Hylemya platura, seedcorn maggot
Agromyza parvicornis, corn blotch leafminer
Anaphothrips obscurus, grass thrips
Solenopsis milesta, thief ant
Tetranychus urticae, two-spotted spider mite

Transgenic plants containing one or more genes that code for an insecticidal resistance and express one or more toxins are known and some of them are commercially available. Examples of such plants are: YieldGard® (maize variety that expresses a CryIA(b) toxin); YieldGard Rootworm® (maize variety that expresses a CryIIIB(b1) toxin); YieldGard Plus® (maize variety that expresses a CryIA(b) and a CryIIIB(b1) toxin); Starlink® (maize variety that expresses a Cry9(c) toxin); Herculex I® (maize variety that expresses a CryIF(a2) toxin and the enzyme phosphinothricine N-acetyltransferase (PAT) to achieve tolerance to the herbicide glufosinate ammonium); NuCOTN 33B® (cotton variety that expresses a CryIA(c) toxin); Bollgard I® (cotton variety that expresses a CryIA(c) toxin); Bollgard II® (cotton variety that expresses a CryIA(c) and a CryIIA(b) toxin); VIPCOT® (cotton variety that expresses a VIP toxin); NewLeaf® (potato variety that expresses a CryIIIA toxin); NatureGard® and Protecta®.

Further examples of such transgenic crops are:

1. **Bt11 Maize** from Syngenta Seeds SAS, Chemin de l'Hobit 27, F-31 790 St. Sauveur, France, registration number C/FR/96/05/10. Genetically modified *Zea mays* which has been rendered resistant to attack by the European corn borer (*Ostrinia nubilalis* and *Sesamia nonagrioides*) by transgenic expression of a truncated CryIA(b) toxin. Bt11 maize also transgenically expresses the enzyme PAT to achieve tolerance to the herbicide glufosinate ammonium.

2. **Bt176 Maize** from Syngenta Seeds SAS, Chemin de l'Hobit 27, F-31 790 St. Sauveur, France, registration number C/FR/96/05/10. Genetically modified *Zea mays* which has been rendered resistant to attack by the European corn borer (*Ostrinia nubilalis* and *Sesamia nonagrioides*) by transgenic expression of a CryIA(b) toxin. Bt176 maize also transgenically expresses the enzyme PAT to achieve tolerance to the herbicide glufosinate ammonium.

3. **MIR604 Maize** from Syngenta Seeds SAS, Chemin de l'Hobit 27, F-31 790 St. Sauveur, France, registration number C/FR/96/05/10. Maize which has been rendered insect-resistant by transgenic expression of a modified CryIIIA toxin. This toxin is Cry3A055 modified by insertion of a cathepsin-D-protease recognition sequence. The preparation of such transgenic maize plants is described in WO 03/018810.

4. **MON 863 Maize** from Monsanto Europe S.A. 270-272 Avenue de Tervuren, B-1150 Brussels, Belgium, registration number C/DE/02/9. MON *863* expresses a CryIIIB(b1) toxin and has resistance to certain Coleoptera insects.

5. **IPC 531 Cotton** from Monsanto Europe S.A. 270-272 Avenue de Tervuren, B-1150 Brussels, Belgium, registration number C/ES/96/02.

6. **1507 Maize** from Pioneer Overseas Corporation, Avenue Tedesco, 7 B-1160 Brussels, Belgium, registration number C/NL/00/10. Genetically modified maize for the expression of the protein Cry1F for achieving resistance to certain Lepidoptera insects and of the PAT protein for achieving tolerance to the herbicide glufosinate ammonium.

7. **NK603 × MON 810 Maize** from Monsanto Europe S.A. 270-272 Avenue de Tervuren, B-1150 Brussels, Belgium, registration number C/GB/02/M3/03. Consists of conventionally bred hybrid maize varieties by crossing the genetically modified varieties NK603 and MON 810. NK603 × MON 810 Maize transgenically expresses the protein CP4 EPSPS, obtained from *Agrobacterium sp.* strain CP4, which imparts tolerance to the herbicide Roundup® (contains glyphosate), and also a CryIA(b) toxin obtained from *Bacillus thuringiensis subsp. kurstaki* which brings about tolerance to certain Lepidoptera, including the European corn borer.

Transgenic crops of insect-resistant plants are also described in BATS (Zentrum für Biosicherheit und Nachhaltigkeit, Zentrum BATS, Clarastrasse 13, 4058 Basel, Switzerland) Report 2003, (http://bats.ch).

In the context of the present invention, fungus-resistant transgenic crop plants are to be understood as being those which have been so transformed by the use of recombinant DNA techniques that they are capable of synthesising antipathogenic substances having a selective action, such as, for example, the so-called "pathogenesis-related proteins" (PRPs, see e.g. EP-A-0 392 225). Examples of such antipathogenic substances and transgenic plants capable of synthesising such antipathogenic substances are known, for example, from EP-A-0 392 225, WO 95/33818 and EP-A-0 353 191. The methods of producing such transgenic plants are generally known to the person skilled in the art and are described, for example, in the publications mentioned above.

Antipathogenic substances which can be expressed by such transgenic plants include, for example, ion channel blockers, such as blockers for sodium and calcium channels, for example the viral KP1, KP4 or KP6 toxins; stilbene synthases; bibenzyl synthases; chitinases; glucanases; the so-called "pathogenesis-related proteins" (PRPs; see e.g. EP-A-0 392 225); antipathogenic substances produced by microorganisms, for example peptide antibiotics or heterocyclic antibiotics (see e.g. WO 95/33818) or protein or polypeptide factors involved in plant pathogen defence (so-called "plant disease resistance genes", as described in WO 03/000906).

In the context of the present invention, pest-resistant and/or fungus-resistant transgenic useful plants include expressly those useful plants which, in addition to pest-resistance and/or fungus-resistance, also possess herbicide tolerance. Of the group of herbicide-tolerant useful plants, preference is given according to the invention to those having tolerance to glyphosate, glufosinate ammonium, ALS (acetolactate synthase) inhibitors, e.g. sulfonylureas, for example primisulfuron, prosulfuron and trifloxysulfuron, or bromoxynil, such as Bt11 maize or Herculex I® maize.

Areas of cultivation are areas of land on which the crop plants are already growing and also areas of land on which it is intended to grow those crop plants.

The following Examples further illustrate, but do not limit, the invention.

Preparation Examples:

Example P1: Preparation of 1-oxy-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester:
197 g (2.1 mol) of hydrogen peroxide in the form of the urea adduct are stirred into a solution of 132 g (0.6 mol) of 5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester in 1000 ml of 1,2-dichloroethane. 346 g (1.65 mol) of trifluoroacetic anhydride are slowly added over 2.5 hours at a temperature of –10°C, with cooling (CO_2/acetone bath). The reaction mixture is then stirred for 2 hours at a temperature of 0°C and then for 12 hours at ambient temperature. The reaction mixture is then poured into ice-water and adjusted to pH 6-7 with 30 % sodium hydroxide solution. The mixture is extracted several times with 1,2-dichloroethane, dried over sodium sulfate and concentrated to dryness by evaporation. Chromatography on silica gel (eluant: ethyl acetate / hexane 1:4) is carried out in order to separate off subsidiary products. After removal of the eluant, 98.4 g of 1-oxy-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester (m.p. 64.5 to 65°C) are obtained.

Example P2: Preparation of 6-hydroxy-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester:
450 ml of trifluoroacetic anhydride are added dropwise to a mixture of 77.6 g (0.33 mol) of 1-oxy-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester in 900 ml of dimethylformamide at a temperature of 0°C over 3.5 hours. The mixture is then heated to a temperature of from 45 to 50°C and is stirred for 2.5 hours. The reaction mixture is then concentrated under reduced pressure (2.5 kPa). The oily residue is poured into ice-water and adjusted to pH 5.5 with 30 % sodium hydroxide solution. A crystallised product is obtained which is filtered off, washed with water and dried *in vacuo* at a temperature of 80°C. 61.6 g (79.4 %) of 6-hydroxy-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester (m.p. 141-141.5°C) are obtained.

Example P3: Preparation of 6-chloro-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester:
16.5 g (70 mmol) of 6-hydroxy-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester in 20 ml of phenyl dichlorophosphate are heated in a pressure reactor for 30 minutes at a temperature of 170°C. The cooled reaction mixture is taken up in ethyl acetate, washed once with cold sodium chloride solution, dried over sodium sulfate and then concentrated. To remove phosphate-containing constituents, the residue that remains behind is chromatographed on silica gel (eluant: ethyl acetate / hexane 1:4) and is then concentrated to dryness

by evaporation. 16.2 g (91.3 %) of 6-chloro-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester are obtained in the form of an oil; ^{1}H NMR ($CDCl_3$): 8.17, m, 2H; 4.52, q, 2H; 1.44, t, 3H.

Example P4: Preparation of 6-(morpholin-4-yl)-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester:

6.45 g (25 mmol) of 6-chloro-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester are heated at a temperature of 110°C for 1 hour in the presence of 5.5 g (63 mmol) of morpholine and a catalytic amount of 4-N,N-dimethylaminopyridine in 50 ml of N-methylpyrrolidone. The reaction mixture is adjusted to pH 4 with dilute hydrochloric acid, extracted with ethyl acetate, dried over magnesium sulfate and then concentrated. In order to remove polar subsidiary products, the residue is chromatographed on silica gel and then concentrated to dryness by evaporation, yielding 7.08 g of 6-(morpholin-4-yl)-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester in the form of an oil; ^{1}H NMR ($CDCl_3$): 7.97, d, 1H; 7.68, d, 1H; 4.42, q, 2H; 3.83, m, 4H; 3.40, m, 4H; 1.42, t, 3H.

Example P5: Preparation of 6-(morpholin-4-yl)-5-trifluoromethyl-pyridine-2-carboxylic acid:

7 g (23 mmol) of 6-(morpholin-4-yl)-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester are added to a mixture of 30 ml of dioxane and 25 ml of water in the presence of 1.55 g of potassium hydroxide and the reaction mixture is stirred at ambient temperature for 30 minutes. The reaction mixture is then adjusted to pH 3 and extracted with ethyl acetate, dried over sodium sulfate and concentrated. Addition of hexane causes 6-(morpholin-4-yl)-5-trifluoromethyl-pyridine-2-carboxylic acid (yield 93.2%) to precipitate out (m.p.: 116-117°C).

Example P6: Preparation of 6-(morpholin-4-yl)-5-trifluoromethyl-pyridine-2-carboxylic acid chloride:

0.83 g (3 mmol) of 6-(morpholin-4-yl)-5-trifluoromethyl-pyridine-2-carboxylic acid and 0.46 g (3.6 mmol) of oxalyl chloride in 10 ml of dichloromethane are heated at boiling temperature for 15 minutes in the presence of a drop of dimethylformamide. The solution is then concentrated by evaporation, yielding 6-(morpholin-4-yl)-5-trifluoromethyl-pyridine-2-carboxylic acid chloride in the form of a crystalline product (m.p.: 72-73°C).

Example P7: Preparation of 6-(acetyl-methyl-amino)-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester:

At a temperature of 0°C, with cooling, a solution of 1.46 g (11.5 mmol) of oxalyl chloride in 5 ml of dichloromethane is added dropwise to a solution of 0.84 g (11.5 mmol) of N-methyl-acetamide and 2.45 g (22.9 mmol) of lutidine in 40 ml of dichloromethane. After 20 minutes, 2.45 g (10.4 mmol) of 1-oxy-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester dissolved in 5 ml of dichloromethane are added. The reaction mixture is heated to ambient temperature and then heated at boiling temperature for 1 hour. The reaction mixture is then extracted with water against dichloromethane, dried over $MgSO_4$ and concentrated to dryness by evaporation. The resulting residue is chromatographed on silica gel (eluant: ethyl acetate / hexane 3:7), 6-(acetyl-methyl-amino)-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester being isolated as main component (m.p.: 145-145.5°C).

Example P8: Preparation of 6-([1,3]dioxolan-2-ylmethoxy)-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester:

1.88 g (8 mmol) of 6-hydroxy-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester and 1.47 g (8 mmol) of 2-bromomethyl-1,3-dioxolane in 30 ml of acetonitrile are heated at reflux temperature in the presence of 1.22 g (8.8 mmol) of potassium carbonate and catalytic amounts of potassium iodide and 18-crown-6 for 6 hours. The reaction mixture is then extracted with ethyl acetate against water and dilute acid at pH 3, dried over sodium sulfate and concentrated by evaporation. The residue is chromatographed on silica gel (eluant: ethyl acetate / hexane 15:85), yielding 6-([1,3]dioxolan-2-ylmethoxy)-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester in the form of an oil; ^1H NMR ($CDCl_3$): 8.00, d, 1H; 7.76, d, 1H; 5.40, t, 1H; 4.61, d, 2H; 4.42, q, 2H; 4.09, m, 2H; 3.93, m, 2H; 1.42, t, 3H.

Example P9: Preparation of 6-(tetrahydro-furan-3-yloxy)-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester:

2.53 g (14.5 mmol) of azodicarboxylic acid diethyl ester (DEAD) are added dropwise to a solution of 2.35 g (10 mmol) of 6-hydroxy-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester and 3.93 g (15 mmol) of triphenylphosphine in 30 ml of dimethoxyethane, the temperature being maintained at a maximum of 35°C. After 1 hour at ambient temperature, the reaction mixture is concentrated to dryness by evaporation. The residue is chromatographed on silica gel (eluant: ethyl acetate / hexane 1:4). 2.85 g (93.4 %) of 6-(tetrahydrofuran-3-yloxy)-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester are obtained (m.p.: 45-45.5°C).

Example P10: 6-Methyl-5-trifluoromethyl-pyridinecarboxylic acid ethyl ester:
6.9 g (6 mmol) of tetrakis(triphenylphosphine)palladium and 8.3 g (66 mmol) of 2,4,6-trimethyl-cyclotriboroxane are added to a solution of 15.2 g (60 mmol) of 6-chloro-5-trifluoromethyl-pyridinecarboxylic acid ethyl ester and 33.1 g (0.24 mol) of potassium carbonate in 150 ml of dioxane and the mixture is then heated for 2.5 hours at reflux temperature. The end point of the reaction is determined by thin-layer chromatography. The reaction mixture is cooled, poured into ice-water and is then adjusted to pH 5 with concentrated hydrochloric acid. To separate off solid constituents, a filtration aid (Hyflo®) is added and filtered off. The filtrate is extracted with ethyl acetate. The filtrate, dried over sodium sulfate, is concentrated to dryness by evaporation and chromatographed on silica gel (eluant: ethyl acetate / hexane 7.5:92.5). 11.28 g (87.8 %) of 6-methyl-5-trifluoromethyl-pyridinecarboxylic acid ethyl ester are obtained in the form of an oil; ^{1}H NMR ($CDCl_3$): 8.05, "s", 2H; 4.48, q, 2H; 2.31, 2, 3H; 1.42, t, 3H.

Example P11: 6-Bromomethyl-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester:
A catalytic amount of aza,aza-diisobutyronitrile is added to 1 g (4.3 mmol) of 6-methyl-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester and 0.92 g of N-bromo-succinimide in 20 ml of carbon tetrachloride. The mixture is heated at reflux temperature using a light source (200 W lamp). Cooling is then carried out and the reaction product is filtered off and purified using an HPLC technique (eluant: ethyl acetate/hexane 1:4). 6-Bromomethyl-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester is obtained; ^{1}H NMR ($CDCl_3$): 6.14, "s", 2H; 4.78, s, 2H; 4.49, q, 2H; 1.45, t, 3H.

Example P12: 6-(2-Methoxy-ethoxymethyl)-5-trifluoromethyl-pyridine-2-carboxylic acid:
0.6 g (2 mmol) of 6-bromomethyl-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester, dissolved in 3 ml of tetrahydrofuran, is introduced into 0.25 g (5.8 mmol) of sodium hydride (as a 55 % dispersion in oil) in 10 ml of dry tetrahydrofuran and stirring is carried out for 2 hours at room temperature. The end point of the reaction is determined by means of thin-layer chromatography. Water is then added. After hydrolysis of the ester group is complete (again demonstrated by means of thin-layer chromatography), extraction with diethyl ether is carried out. The aqueous phase, which contains the reaction product, is then adjusted to pH 2 with hydrochloric acid. Extraction with ethyl acetate is then carried out, followed by drying over sodium sulfate and concentration to dryness by evaporation. 6-(2-Methoxy-ethoxymethyl)-5-trifluoromethyl-pyridine-2-carboxylic acid is obtained; ^{1}H NMR ($CDCl_3$): 8.26, d, 1H; 8.17, d, 1H; 7.3, b, OH; 4.96, s, 2H; 3.91, m, 2H; 3.71, m, 2H; 3.48, s, 3H.

Example P13: 2-(6-Thiomorpholin-4-yl-5-trifluoromethyl-pyridine-2-carbonyl)-cyclohexane-1,3-dione:

0.31 g (1 mmol) of 6-thiomorpholin-4-yl-5-trifluoromethyl-pyridine-2-carboxylic acid chloride, prepared with oxalyl chloride, is added to 0.11 g (1 mmol) of cyclohexane-1,3-dione and 0.25 g (2.5 mmol) of triethylamine in 15 ml of acetonitrile and the reaction mixture is stirred at room temperature for 2 hours. 2 drops of acetone cyanohydrin are then added and the mixture is stirred for 12 hours. The reaction mixture is taken up in ethyl acetate and extracted with dilute hydrochloric acid at pH 3. After concentration of the organic phase by evaporation, the residue that remains behind is chromatographed on silica gel (eluant: ethyl acetate/methanol/triethylamine 85:10:5). After concentration by evaporation, the triethyl-ammonium salt of 2-(6-thiomorpholin-4-yl-5-trifluoromethyl-pyridine-2-carbonyl)-cyclohexane-1,3-dione is obtained in the form of a resinous product. In order to free the desired end product, the resinous product is taken up in ethyl acetate, extracted again with dilute hydrochloric acid, dried over sodium sulfate and again concentrated to dryness by evaporation. After recrystallisation with ethyl acetate and hexane, 2-(6-thiomorpholin-4-yl-5-trifluoromethyl-pyridine-2-carbonyl)-cyclohexane-1,3-dione is obtained in crystalline form (m.p.: 106-106.5°C).

Example P14: 2-(6-Pyrazol-1-yl-5-trifluoromethyl-pyridine-2-carbonyl)-cyclohexane-1,3-dione:

0.32 g (1 mmol) of 2-(6-chloro-5-trifluoromethyl-pyridine-2-carbonyl)-cyclohexane-1,3-dione and 82 mg (1.2 mmol) of pyrazole are added in succession at room temperature to 0.11 g of a 55% sodium hydride dispersion (2.5 mmol) in 8 ml of N-methylpyrrolidone. The reaction mixture is stirred for 1.5 hours at a temperature of 120°C. When the reaction mixture is cool, water is added and the mixture is adjusted to pH 2 and extracted with ethyl acetate. The reaction mixture is then concentrated to dryness by evaporation. The residue is chromatographed on silica gel (eluant: ethyl acetate / hexane / formic acid 49.5:49.5:1). 2-(6-Pyrazol-1-yl-5-trifluoromethyl-pyridine-2-carbonyl)-cyclohexane-1,3-dione is obtained in the form of a resinous product; ^1H NMR ($CDCl_3$): 15.78, b, OH, 8.30, d, 1H; 8.07, d, 1H; 7.69, d, 1H; 7.54, d, 1H; 6.44, m, 1H; 2.80, m, 2H; 2.48, m, 2H; 2.10, m, 2H.

Example P15: 2-[6-(4-Methoxy-phenyl)-5-trifluoromethyl-pyridine-2-carbonyl]-cyclohexane-1,3-dione:

16 mg (0.05 mmol) of 2-(6-chloro-5-trifluoromethyl-pyridine-2-carbonyl)-cyclohexane-1,3-dione and 9 mg (0.05 mmol) of p-methoxyphenyl-boronic acid are dissolved in 0.98 ml of

dimethoxyethane / water / ethanol (7:3:2) and, in a microwave oven, heated at 140°C for 400 seconds in the presence of a catalytic amount of bis(triphenyl)phosphine palladium dichloride and 49 mg (0.15 mmol) of caesium carbonate. When the reaction solution is cool, it is transferred to a deep-well plate. By supplying a stream of nitrogen, the volatile constituents of the reaction solution are removed by evaporation. 0.1 ml of trifluoroacetic acid and 0.4 ml of dimethylformamide are added to the residue and stirring is carried out for 10 minutes. The soluble component is purified by means of HPLC under reversed-phase conditions (eluant: gradient of water and acetonitrile). 2-[6-(4-Methoxy-phenyl)-5-trifluoromethyl-pyridine-2-carbonyl]-cyclohexane-1,3-dione is obtained in the form of a resin.

Example P16: 5-Trifluoromethyl-6-vinyl-pyridine-2-carboxylic acid ethyl ester:
3 g (11.8 mmol) of chloro-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester are dissolved in degassed dioxane, and 4.13 g (13.02 mmol) of tributylvinyltin are added. After the addition of 273 mg (0.236 mmol) of $Pd(Ph_3P)_4$, the reaction mixture is stirred for 20 hours at 95°C. The reaction mixture is concentrated and is chromatographed on silica gel (eluant: ethyl acetate / isohexane 1:5). 2 g of 5-trifluoromethyl-6-vinyl-pyridine-2-carboxylic acid ethyl ester are obtained. ^1H NMR ($CDCl_3$): 8.07(d), J=8.3Hz,1H; 8.034(d), J=8.3Hz, 1H; 7.06-7.18(m), Jab=16.6Hz, Jac=10.5Hz, 1Ha; 6.77(dd), Jba=16.6 Hz, Jbc=2Hz, 1Hb; 5.74(dd), Jca=10.5 Hz, Jcb= 2Hz, 1Hc; 4.487(q), 2H; 1.455(t), 3H.

Example P17: 6-(1-Ethoxy-vinyl)-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester:
1.6 g (6.31 mmol) of chloro-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester are dissolved in 32 ml of degassed dioxane, and 2.5 g (6.92 mmol) of 1-ethoxy-1-tributylvinyltin are added. After the addition of 146 mg (0.126 mmol) of $Pd(Ph_3P)_4$, the reaction mixture is stirred for 20 hours at 95°C. The reaction mixture is concentrated and is chromatographed on silica gel (eluant: ethyl acetate / isohexane 1:5). 0.9 g of 6-(1-ethoxy-vinyl)-5-trifluoromethyl-pyridine-2-carboxylic acid ethyl ester are obtained. ^1H NMR ($CDCl_3$): 8.148 (s), 2H, 4.732(d), Jab=3Hz, 1Ha; 4.509(d), Jba= 3Hz, 1Hb; 4.497(q), CH_2O (ester); 2H, 3.952(q), CH_2O (ether); 2H 1.436(t), CH_3 (ester), 3H; 1.376(t), CH_3 (ether).

By that means it is possible, for example, also for the compounds of formula I listed in the following Table to be prepared, those compounds that are defined as an oil, resin, wax or amorphous solid at least having been characterised in pure form by means of ^1H NMR (nuclear resonance spectroscopy) and/or MS (mass spectrometry).

In general, substituents R_1 are bonded to the pyridyl ring by way of the free valence at the atom on the left-hand side of the substituent R_1, as in the case, for example, of compound 1.001. In that compound, the substituent $R_1 = OCH_2OCH_3$ is bonded to the pyridyl ring by way of the free valence of the oxygen atom on the left-hand side of the substituent. In individual cases, the linking atom is, in addition, marked by means of an apostrophe, as in the case, for example, of compound no. 1.137.

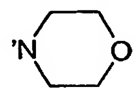
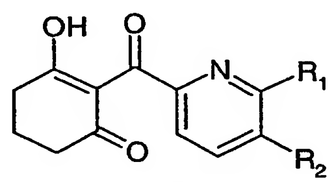
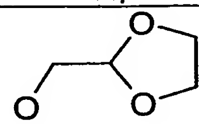
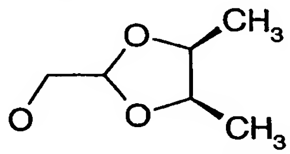
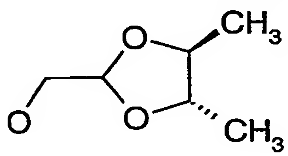
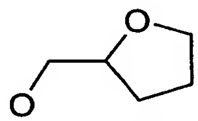
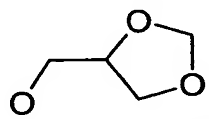
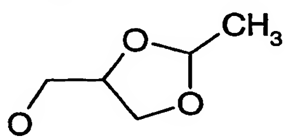
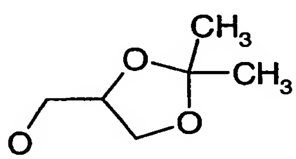
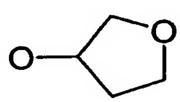
In the case of cyclic substituents R_1 that are bonded directly to the pyridyl ring, the ring atom of the cyclic substituent R_1 linked to the pyridyl is given special emphasis by means of an apostrophe, as, for example, in , where the linkage site is located at the nitrogen atom denoted by 'N.

Table 1: Compounds of formula IA

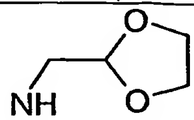
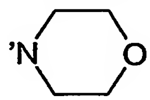
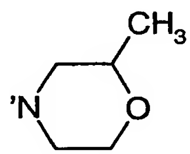
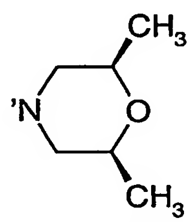
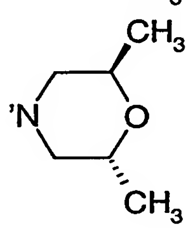
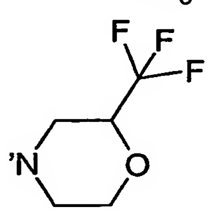
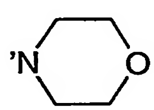
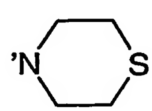
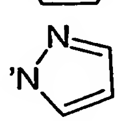


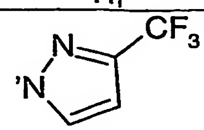
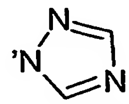
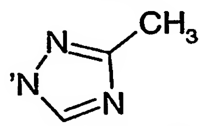
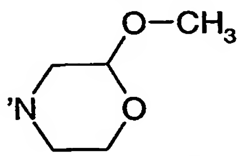
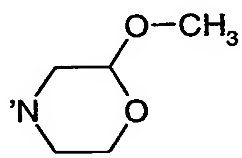
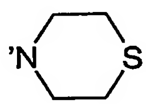
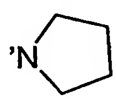
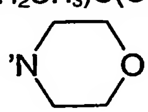
(IA)

Ex. No.	R_1	R_2	Physical properties
1.001	OCH_2OCH_3	CF_3	
1.002	$OCH_2OCH_2CH_3$	CF_3	
1.003	$OCH_2CH_2OCH_3$	CF_3	resin
1.004	$OCH_2CH_2OCH_2CH_3$	CF_3	
1.005	$OCH_2CH_2CH_2OCH_3$	CF_3	
1.006	$OCH(CH_3)CH_2OCH_3$	CF_3	
1.007	$OCH_2CH_2OCH_2CH{=}CH_2$	CF_3	
1.008	$OCH_2CH_2OCH_2C{\equiv}CH$	CF_3	
1.009	OCH_2CH_2O-benzyl	CF_3	
1.010	$OCH_2CH_2ON{=}C(CH_3)_2$	CF_3	
1.011	$OCH_2CH_2OCH_2CH_2OCH_3$	CF_3	
1.012	$OCH_2CH(OCH_3)_2$	CF_3	resin
1.013	$OCH_2CH(OCH_2CH_3)_2$	CF_3	

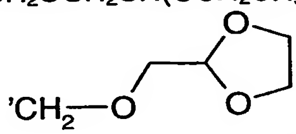
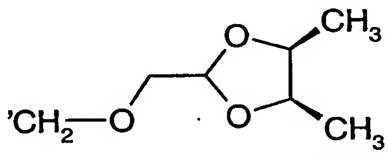
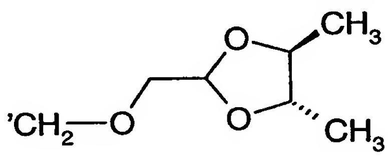
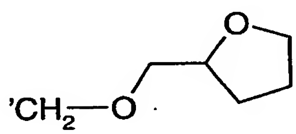
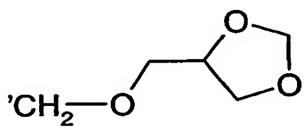
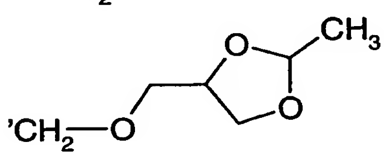
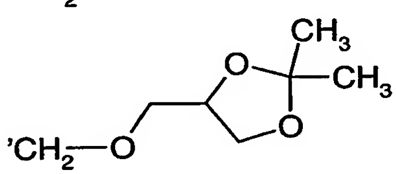
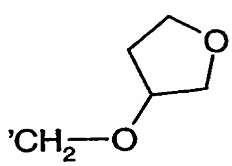
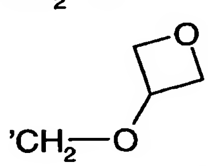
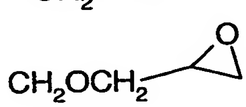
Ex. No.	R_1	R_2	Physical properties
1.014		CF_3	
1.015		CF_3	
1.016		CF_3	
1.017		CF_3	
1.018		CF_3	
1.019		CF_3	
1.020		CF_3	
1.021		CF_3	resin
1.022	O-benzyl	CF_3	resin
1.023	$OCH_2CH_2SCH_3$	CF_3	
1.024	$OCH_2CH_2SCH_2CH_3$	CF_3	
1.025	$OCH_2CH_2S(O)_2CH_3$	CF_3	
1.026	$OCH_2CH_2S(O)_2CH_2CH_3$	CF_3	
1.027	$SCH_2CH_2OCH_3$	CF_3	
1.028	$SCH_2CH_2OCH_2CH_3$	CF_3	
1.029	$OCH_2CH_2OC(O)CH_3$	CF_3	
1.030	$OCH_2CH_2OC(O)$-phenyl	CF_3	
1.031	$OCH_2CH_2OC(O)OCH_2CH_3$	CF_3	
1.032	$OCH_2CH_2OC(O)NHCH_2CH_3$	CF_3	

Ex. No.	R_1	R_2	Physical properties
1.033	$OCH_2CH_2NH_2$	CF_3	
1.034	$OCH_2CH_2NHC(O)CH_3$	CF_3	
1.035	$OCH_2CH_2NHC(O)CH_2CH_3$	CF_3	
1.036	$OCH_2CH_2NHC(O)CH(CH_3)_2$	CF_3	
1.037	$OCH_2CH_2NHC(O)$-cyclopropyl	CF_3	
1.038	$OCH_2CH_2NHC(O)C(CH_3)_3$	CF_3	
1.039	$OCH_2CH_2NHC(O)$-phenyl	CF_3	
1.040	$OCH_2CH_2NHC(O)OCH_3$	CF_3	
1.041	$OCH_2CH_2NHC(O)OCH_2CH_3$	CF_3	resin
1.042	$OCH_2CH_2NHC(O)NHCH_3$	CF_3	
1.043	$OCH_2CH_2NHC(O)NHCH_2CH_3$	CF_3	
1.044	$OCH_2CH_2NHC(O)N(CH_3)_2$	CF_3	
1.045	$OCH_2CH_2NHC(O)N(CH_2CH_3)_2$	CF_3	
1.046	$NHCH_3$	CF_3	
1.047	$NHCH_2CH_3$	CF_3	
1.048	$NHCH_2CH_2CH_3$	CF_3	
1.049	$NHCH_2CH_2CH_2CH_3$	CF_3	
1.050	$NHCH(CH_3)_2$	CF_3	
1.051	$NHC(CH_3)_3$	CF_3	
1.052	$NHCH_2$-cyclopropyl	CF_3	
1.053	NH-phenyl	CF_3	
1.054	NH-benzyl	CF_3	
1.055	$NHCH_2CH{=}CH_2$	CF_3	
1.056	$NHCH_2C{\equiv}CH$	CF_3	
1.057	$N(CH_2CH{=}CH_2)_2$	CF_3	
1.058	$N(CH_2C{\equiv}CH)_2$	CF_3	
1.059	$N(CH_3)_2$	CF_3	viscous oil
1.060	$N(CH_2CH_3)_2$	CF_3	viscous oil
1.061	$N(CH_2CH_2CH_3)_2$	CF_3	
1.062	$N(CH_2CH_2CH_2CH_3)_2$	CF_3	
1.063	$NHCH_2CH_2OH$	CF_3	
1.064	$NHCH_2CH_2OCH_3$	CF_3	resin
1.065	$NHCH(CH_3)CH_3OCH_3$	CF_3	
1.066	$NHCH_2CH(OCH_3)_2$	CF_3	
1.067	$NHCH_2CH(OCH_2CH_3)_2$	CF_3	

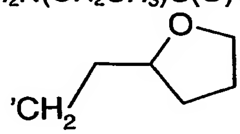
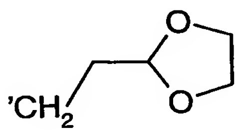
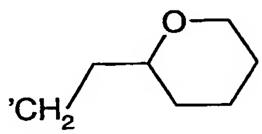
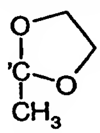
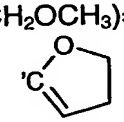
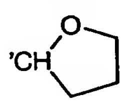
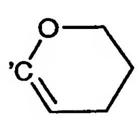
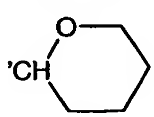
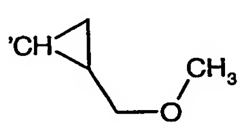
Ex. No.	R_1	R_2	Physical properties
1.068		CF_3	
1.069	$NHCH_2C(O)OCH_3$	CF_3	
1.070	$NHCH(CH_3)C(O)OCH_3$	CF_3	
1.071	$NHCH_2C(O)OCH_2CH_3$	CF_3	
1.072	$NHCH(CH_3)C(O)OCH_2CH_3$	CF_3	
1.073		CF_3	resin
1.074		CF_3	
1.075		CF_3	m.p.:82-83°C
1.076		CF_3	
1.077		CF_3	
1.078		CHF_2	
1.079		CF_3	m.p.: 106-106.5°C, [P13]
1.080		CF_3	resin, [P14]

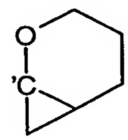
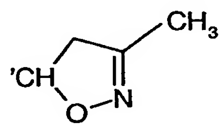
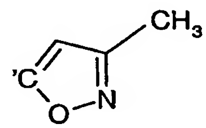
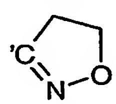
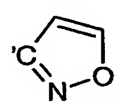
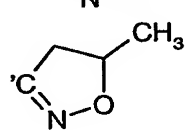
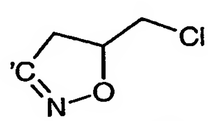
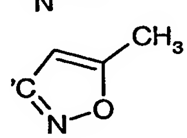
Ex. No.	R_1	R_2	Physical properties
1.081		CF_3	m.p. 137-138°C
1.082		CF_3	resin
1.083		CF_3	
1.084		CF_3	
1.085		CHF_2	
1.086		CHF_2	
1.087		CHF_3	
1.088	$N(CH_3)C(O)H$	CF_3	
1.089	$N(CH_3)C(O)CH_3$	CF_3	m.p. 130-131°C
1.090	$N(CH_3)C(O)CH_2CH_3$	CF_3	m.p. 120-121°C
1.091	$N(CH_3)C(O)$-phenyl	CF_3	m.p. 141-142°C
1.092	$N(CH_3)C(O)$-benzyl	CF_3	resin
1.093	$N(CH_2CH_3)C(O)CH_3$	CF_3	
1.094		OCH_2CF_3	resin
1.095	Cl	CF_3	amorphous crystals
1.096	OCH_3	CF_3	m.p. 80-81°C
1.097	CH_2OH	CF_3	
1.098	CH_2Cl	CF_3	
1.099	CH_2Br	CF_3	
1.100	$CH_2OSO_2CH_3$	CF_3	

Ex. No.	R_1	R_2	Physical properties
1.101	$CH_2OC(O)CH_3$	CF_3	
1.102	$CH_2OC(O)C(CH_3)_3$	CF_3	
1.103	$CH_2OC(O)$phenyl	CF_3	
1.104	$CH_2OC(O)OCH_2CH_3$	CF_3	
1.105	CH_2OCH_3	CF_3	
1.106	$CH_2OCH_2CH_3$	CF_3	
1.107	$CH_2CH_2OCH_3$	CF_3	
1.108	$CH_2CH_2OCH_2CH_3$	CF_3	
1.109	$CH_2CH_2CH_2OCH_3$	CF_3	
1.110	$CH(CH_3)CH_2OCH_3$	CF_3	
1.111	$CH_2OCH_2CH{=}CH_2$	CF_3	
1.112	$CH_2OCH_2C{\equiv}CH$	CF_3	
1.113	$CH_2OCH_2C{\equiv}CCH_3$	CF_3	
1.114	$CH_2OCH_2CH_2C{\equiv}CH$	CF_3	
1.115	$CH_2OCH_2CH_2C{\equiv}CCH_3$	CF_3	
1.116	CH_2O-benzyl	CF_3	
1.117	$CH_2OCH_2CF_3$	CF_3	
1.118	$CH_2OCH_2CH_2F$	CF_3	
1.119	$CH_2OCH_2CH_2Cl$	CF_3	
1.120	$CH_2OCH_2CH_2Br$	CF_3	
1.121	$CH_2OCH_2CH_2C{\equiv}N$	CF_3	
1.122	$CH_2OCH_2C{\equiv}N$	CF_3	
1.123	$CH_2OCH_2OCH_3$	CF_3	
1.124	$CH_2OCH_2OCH_2CH_3$	CF_3	
1.125	$CH_2OCH_2CH_2OH$	CF_3	
1.126	$CH_2OCH_2CH_2OCH_3$	CF_3	resin, [P12]
1.127	$CH_2OCH_2CH_2OCH_2CH_3$	CF_3	
1.128	$CH_2OCH_2CH_2CH_2OCH_3$	CF_3	
1.129	$CH_2OCH(CH_3)CH_2OCH_3$	CF_3	
1.130	$CH_2OCH_2CH_2OCH_2CH{=}CH_2$	CF_3	
1.131	$CH_2OCH_2CH_2OCH_2C{\equiv}CH$	CF_3	
1.132	$CH_2OCH_2CH_2O$-benzyl	CF_3	
1.133	$CH_2OCH_2CH_2ON{=}C(CH_3)_2$	CF_3	
1.134	$CH_2OCH_2CH_2OCH_2CH_2OCH_3$	CF_3	
1.135	$CH_2OCH_2CH(OCH_3)_2$	CF_3	

Ex. No.	R_1	R_2	Physical properties
1.136	$CH_2OCH_2CH(OCH_2CH_3)_2$	CF_3	
1.137		CF_3	
1.138		CF_3	
1.139		CF_3	
1.140		CF_3	
1.141		CF_3	
1.142		CF_3	
1.143		CF_3	
1.144		CF_3	
1.145		CF_3	
1.146		CF_3	
1.147	$CH_2OCH_2CH_2SCH_3$	CF_3	
1.148	$CH_2OCH_2CH_2SCH_2CH_3$	CF_3	

Ex. No.	R_1	R_2	Physical properties
1.149	$CH_2OCH_2CH_2S(O)_2CH_3$	CF_3	
1.150	$CH_2OCH_2CH_2S(O)_2CH_2CH_3$	CF_3	
1.151	$CH_2SCH_2CH_2OCH_3$	CF_3	
1.152	$CH_2SCH_2CH_2OCH_2CH_3$	CF_3	
1.153	$CH_2OCH_2CH_2OC(O)CH_3$	CF_3	
1.154	$CH_2OCH_2CH_2OC(O)$-phenyl	CF_3	
1.155	$CH_2OCH_2CH_2OC(O)OCH_2CH_3$	CF_3	
1.156	$CH_2OCH_2CH_2OC(O)NHCH_2CH_3$	CF_3	
1.157	$CH_2OCH_2CH_2NH_2$	CF_3	
1.158	$CH_2OCH_2CH_2NHC(O)CH_3$	CF_3	
1.159	$CH_2OCH_2CH_2NHC(O)CH_2CH_3$	CF_3	
1.160	$CH_2OCH_2CH_2NHC(O)CH(CH_3)_2$	CF_3	
1.161	$CH_2OCH_2CH_2NHC(O)$-cyclopropyl	CF_3	
1.162	$CH_2OCH_2CH_2NHC(O)C(CH_3)_3$	CF_3	
1.163	$CH_2OCH_2CH_2NHC(O)$-phenyl	CF_3	
1.164	$CH_2OCH_2CH_2NHC(O)OCH_3$	CF_3	
1.165	$CH_2OCH_2CH_2NHC(O)OCH_2CH_3$	CF_3	
1.166	$CH_2OCH_2CH_2NHC(O)NHCH_3$	CF_3	
1.167	$CH_2OCH_2CH_2NHC(O)NHCH_2CH_3$	CF_3	
1.168	$CH_2OCH_2CH_2NHC(O)N(CH_3)_2$	CF_3	
1.169	$CH_2OCH_2CH_2NHC(O)N(CH_2CH_3)_2$	CF_3	
1.170	$CH_2N(SO_2CH_3)CH_3$	CF_3	
1.171	$CH_2N(SO_2CH_3)CH_2CH_3$	CF_3	
1.172	$CH_2N(SO_2CH_2CH_3)CH_2CH_3$	CF_3	
1.173	$CH_2N(SO_2CH_3)CH_2CF_3$	CF_3	
1.174	$CH_2N(SO_2CH_3)CH_2CHOCH_3$	CF_3	
1.175	$CH_2N(SO_2CH_3)CH_2$-cyclopropyl	CF_3	
1.176	$CH_2N(SO_2CH_3)$-phenyl	CF_3	
1.177	$CH_2N(SO_2CH_3)$-benzyl	CF_3	
1.178	$CH_2N(SO_2CH_3)CH_2CH{=}CH_2$	CF_3	
1.179	$CH_2N(SO_2CH_3)CH_2C{\equiv}CH$	CF_3	
1.180	$CH_2N(CH_3)C(O)H$	CF_3	
1.181	$CH_2N(CH_3)C(O)CH_3$	CF_3	
1.182	$CH_2N(CH_3)C(O)CH_2CH_3$	CF_3	
1.183	$CH_2N(CH_3)C(O)$-phenyl	CF_3	

Ex. No.	R_1	R_2	Physical properties
1.184	$CH_2N(CH_3)C(O)$-benzyl	CF_3	
1.185	$CH_2N(CH_2CH_3)C(O)CH_3$	CF_3	
1.186		CF_3	
1.187		CF_3	
1.188		CF_3	
1.189	$C(OCH_2CH_3){=}CH_2$	CF_3	m.p. 142-143°C
1.190	$CH_2C(O)CH_3$	CF_3	
1.191	$C(OCH_3)_2$	CF_3	
1.192		CF_3	waxy
1.193	$CH_2C(O)CH_2OCH_3$	CF_3	
1.194	$CH_2C(O)CH_2OCH_2CH_2OCH_3$	CF_3	
1.195	$CH_2C(O)CH_2N(SO_2CH_3)CH_3$	CF_3	
1.196	$C(CH_2OCH_3){=}CH_2$	CF_3	
1.197		CF_3	
1.198		CF_3	
1.199		CF_3	crystalline solid
1.200		CF_3	
1.201		CF_3	cis and/or trans

Ex. No.	R_1	R_2	Physical properties
1.202		CF_3	
1.203		CF_3	amorphous solid
1.204		CF_3	amorphous solid
1.205	$C(O)CH_3$	CF_3	
1.206	$C(O)CH_2OCH_3$	CF_3	
1.207	$C(O)CH_2OCH_2CH_2OCH_3$	CF_3	
1.208	$C(O)CH_2N(SO_2CH_3)CH_3$	CF_3	
1.209	4-CF_3-phenyl	CF_3	resin
1.210	4-MeO-phenyl	CF_3	resin, [P15]
1.211	CH_3	CF_3	resin
1.212	$C{\equiv}N$	CF_3	resin
1.213		CF_3	
1.214		CF_3	
1.215		CF_3	
1.216		CF_3	
1.217		CF_3	
1.218	$C(OCH_2CH_2CH_2CH_3){=}CH_2$	CF_3	
1.219	$CH_2CH_2OCH_2CH_2CH_2CH_3$	CF_3	
1.220	CH_2O-phenyl	CF_3	
1.221	CH_2NHSO_2-phenyl	CF_3	
1.222	$CH_2N(SO_2CH_3)$-cyclopropyl	CF_3	

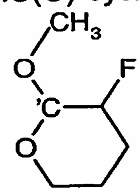
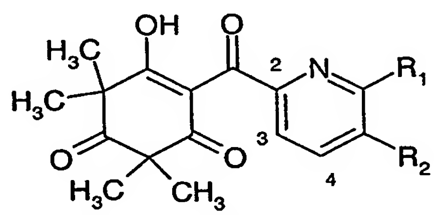
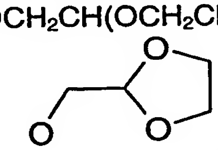
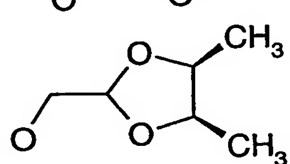
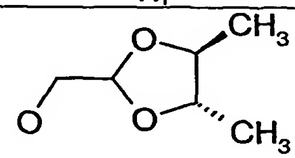
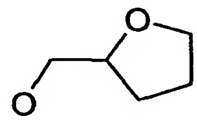
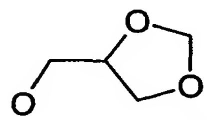
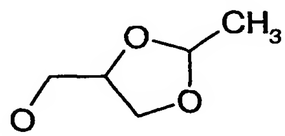
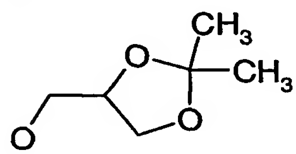
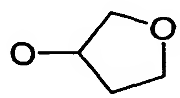
Ex. No.	R_1	R_2	Physical properties
1.223	$CH_2N(SO_2CH_2CH_3)$-phenyl	CF_3	
1.224	$CH_2NHC(O)$-cyclopropyl	CF_3	
1.225		CF_3	

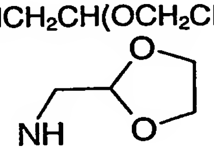
Table 2: Compounds of formula IB

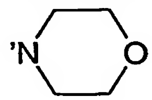
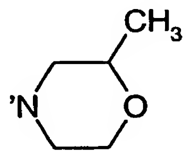
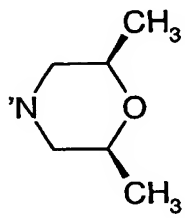
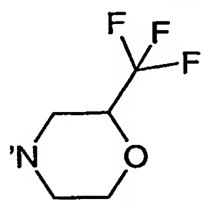
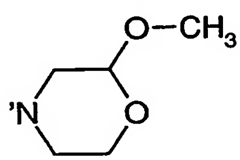
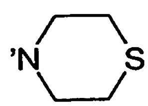
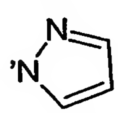
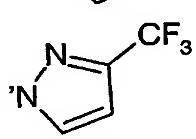
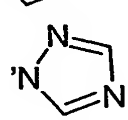
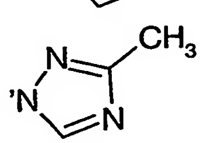


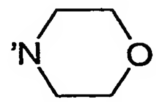
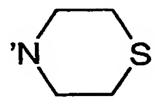
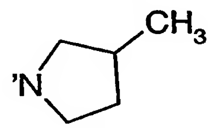
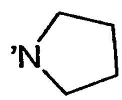
(IB)

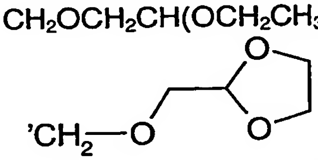
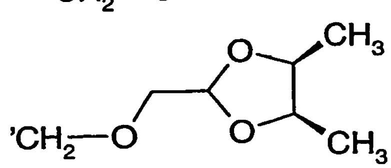
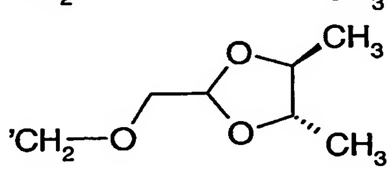
Ex. No.	R_1	R_2	Physical properties
2.001	OCH_2OCH_3	CF_3	
2.002	$OCH_2OCH_2CH_3$	CF_3	
2.003	$OCH_2CH_2OCH_3$	CF_3	resin
2.004	$OCH_2CH_2OCH_2CH_3$	CF_3	
2.005	$OCH_2CH_2CH_2OCH_3$	CF_3	
2.006	$OCH(CH_3)CH_2OCH_3$	CF_3	
2.007	$OCH_2CH_2OCH_2CH{=}CH_2$	CF_3	
2.008	$OCH_2CH_2OCH_2C{\equiv}CH$	CF_3	
2.009	OCH_2CH_2O-benzyl	CF_3	
2.010	$OCH_2CH_2ON{=}C(CH_3)_2$	CF_3	resin
2.011	$OCH_2CH_2OCH_2CH_2OCH_3$	CF_3	
2.012	$OCH_2CH(OCH_3)_2$	CF_3	
2.013	$OCH_2CH(OCH_2CH_3)_2$	CF_3	
2.014		CF_3	
2.015		CF_3	

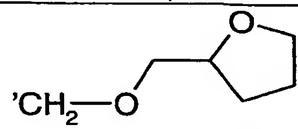
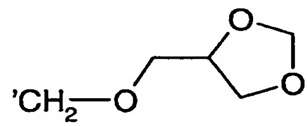
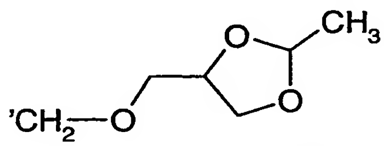
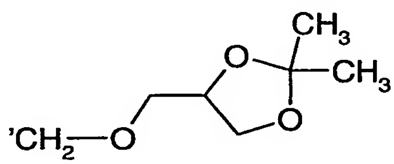
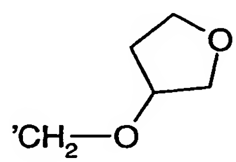
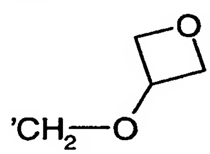
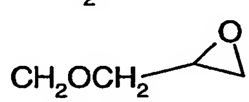
Ex. No.	R_1	R_2	Physical properties
2.016		CF_3	
2.017		CF_3	
2.018		CF_3	
2.019		CF_3	
2.020		CF_3	
2.021		CF_3	resin
2.022	O-benzyl	CF_3	resin
2.023	$OCH_2CH_2SCH_3$	CF_3	
2.024	$OCH_2CH_2SCH_2CH_3$	CF_3	
2.025	$OCH_2CH_2S(O)_2CH_3$	CF_3	
2.026	$OCH_2CH_2S(O)_2CH_2CH_3$	CF_3	
2.027	$SCH_2CH_2OCH_3$	CF_3	
2.028	$SCH_2CH_2OCH_2CH_3$	CF_3	
2.029	$OCH_2CH_2OC(O)CH_3$	CF_3	
2.030	$OCH_2CH_2OC(O)$-phenyl	CF_3	
2.031	$OCH_2CH_2OC(O)OCH_2CH_3$	CF_3	
2.032	$OCH_2CH_2OC(O)NHCH_2CH_3$	CF_3	
2.033	$OCH_2CH_2NH_2$	CF_3	
2.034	$OCH_2CH_2NHC(O)CH_3$	CF_3	
2.035	$OCH_2CH_2NHC(O)CH_2CH_3$	CF_3	
2.036	$OCH_2CH_2NHC(O)CH(CH_3)_2$	CF_3	
2.037	$OCH_2CH_2NHC(O)$-cyclopropyl	CF_3	
2.038	$OCH_2CH_2NHC(O)C(CH_3)_3$	CF_3	

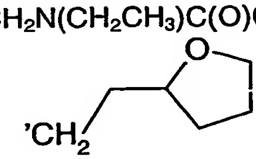
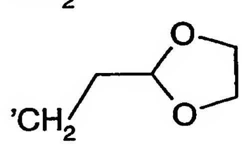
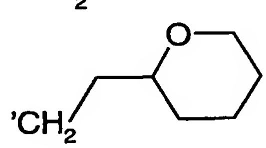
Ex. No.	R_1	R_2	Physical properties
2.039	$OCH_2CH_2NHC(O)$-phenyl	CF_3	
2.040	$OCH_2CH_2NHC(O)OCH_3$	CF_3	
2.041	$OCH_2CH_2NHC(O)OCH_2CH_3$	CF_3	
2.042	$OCH_2CH_2NHC(O)NHCH_3$	CF_3	
2.043	$OCH_2CH_2NHC(O)NHCH_2CH_3$	CF_3	
2.044	$OCH_2CH_2NHC(O)N(CH_3)_2$	CF_3	
2.045	$OCH_2CH_2NHC(O)N(CH_2CH_3)_2$	CF_3	
2.046	$NHCH_3$	CF_3	
2.047	$NHCH_2CH_3$	CF_3	
2.048	$NHCH_2CH_2CH_3$	CF_3	
2.049	$NHCH_2CH_2CH_2CH_3$	CF_3	
2.050	$NHCH(CH_3)_2$	CF_3	
2.051	$NHC(CH_3)_3$	CF_3	
2.052	$NHCH_2$-cyclopropyl	CF_3	
2.053	NH-phenyl	CF_3	
2.054	NH-benzyl	CF_3	
2.055	$NH\text{-}CH_2CH{=}CH_2$	CF_3	
2.056	$NHCH_2C{\equiv}CH$	CF_3	
2.057	$N(CH_2CH{=}CH_2)_2$	CF_3	
2.058	$N(CH_2C{\equiv}CH)_2$	CF_3	
2.059	$N(CH_3)_2$	CF_3	m.p.: 95-96°C
2.060	$N(CH_2CH_3)_2$	CF_3	m.p.: 85-86°C
2.061	$N(CH_2CH_2CH_3)_2$	CF_3	
2.062	$N(CH_2CH_2CH_2CH_3)_2$	CF_3	
2.063	$NHCH_2CH_2OH$	CF_3	
2.064	$NHCH_2CH_2OCH_3$	CF_3	resin
2.065	$NHCH(CH_3)CH_3OCH_3$	CF_3	
2.066	$NHCH_2CH(OCH_3)_2$	CF_3	
2.067	$NHCH_2CH(OCH_2CH_3)_2$	CF_3	
2.068		CF_3	
2.069	$NHCH_2C(O)OCH_3$	CF_3	
2.070	$NHCH(CH_3)C(O)OCH_3$	CF_3	
2.071	$NHCH_2C(O)OCH_2CH_3$	CF_3	

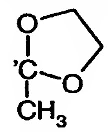
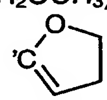
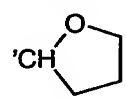
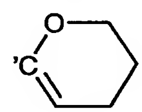
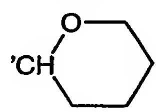
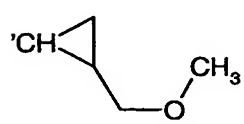
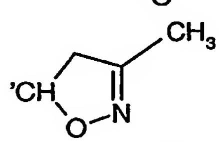
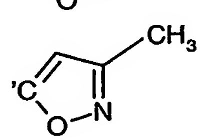
Ex. No.	R_1	R_2	Physical properties
2.072	$NHCH(CH_3)C(O)OCH_2CH_3$	CF_3	
2.073		CF_3	m.p.: 123-124°C
2.074		CF_3	
2.075		CF_3	m.p.: 134-135°C
2.076		CF_3	
2.077		CF_3	
2.078		CF_3	m.p.: 120-121°C
2.079		CF_3	
2.080		CF_3	m.p.: 99-100°C
2.081		CF_3	
2.082		CF_3	

Ex. No.	R_1	R_2	Physical properties
2.083		CHF_2	
2.084		CHF_2	
2.085		CHF_2	
2.086		CHF_2	
2.087	$N(CH_3)C(O)H$	CF_3	
2.088	$N(CH_3)C(O)CH_3$	CF_3	m.p.: 150-151°C
2.089	$N(CH_3)C(O)CH_2CH_3$	CF_3	m.p.: 117-118°C
2.090	$N(CH_3)C(O)$-phenyl	CF_3	resin
2.091	$N(CH_3)C(O)$-benzyl	CF_3	m.p.: 107-108°C
2.092	$N(CH_2CH_3)C(O)CH_3$	CF_3	
2.093	OH	CF_3	m.p.: 203-204°C
2.094	OCH_3	CF_3	m.p.: 120-121°C
2.095	OCH_2CH_3	CF_3	m.p.: 117-118°C
2.096	CH_2OH	CF_3	
2.097	CH_2Cl	CF_3	
2.098	CH_2Br	CF_3	
2.099	$CH_2OSO_2CH_3$	CF_3	
2.100	$CH_2OC(O)CH_3$	CF_3	
2.101	$CH_2OC(O)C(CH_3)_3$	CF_3	
2.102	$CH_2OC(O)$phenyl	CF_3	
2.103	$CH_2OC(O)OCH_2CH_3$	CF_3	
2.104	CH_2OCH_3	CF_3	
2.105	$CH_2OCH_2CH_3$	CF_3	
2.106	$CH_2CH_2OCH_3$	CF_3	
2.107	$CH_2CH_2OCH_2CH_3$	CF_3	
2.108	$CH_2CH_2CH_2OCH_3$	CF_3	
2.109	$CH(CH_3)CH_2OCH_3$	CF_3	
2.110	$CH_2OCH_2CH{=}CH_2$	CF_3	

Ex. No.	R_1	R_2	Physical properties
2.111	$CH_2OCH_2C{\equiv}CH$	CF_3	
2.112	$CH_2OCH_2C{\equiv}CCH_3$	CF_3	
2.113	$CH_2OCH_2CH_2C{\equiv}CH$	CF_3	
2.114	$CH_2OCH_2CH_2C{\equiv}CCH_3$	CF_3	
2.115	CH_2O-benzyl	CF_3	
2.116	$CH_2OCH_2CF_3$	CF_3	
2.117	$CH_2OCH_2CH_2F$	CF_3	
2.118	$CH_2OCH_2CH_2Cl$	CF_3	
2.119	$CH_2OCH_2CH_2Br$	CF_3	
2.120	$CH_2OCH_2CH_2C{\equiv}N$	CF_3	
2.121	$CH_2OCH_2C{\equiv}N$	CF_3	
2.122	$CH_2OCH_2OCH_3$	CF_3	
2.123	$CH_2OCH_2OCH_2CH_3$	CF_3	
2.124	$CH_2OCH_2CH_2OH$	CF_3	
2.125	$CH_2OCH_2CH_2OCH_3$	CF_3	
2.126	$CH_2OCH_2CH_2OCH_2CH_3$	CF_3	
2.127	$CH_2OCH_2CH_2CH_2OCH_3$	CF_3	
2.128	$CH_2OCH(CH_3)CH_2OCH_3$	CF_3	
2.129	$CH_2OCH_2CH_2OCH_2CH{=}CH_2$	CF_3	
2.130	$CH_2OCH_2CH_2OCH_2C{\equiv}CH$	CF_3	
2.131	$CH_2OCH_2CH_2O$-benzyl	CF_3	
2.132	$CH_2OCH_2CH_2ON{=}C(CH_3)_2$	CF_3	
2.133	$CH_2OCH_2CH_2OCH_2CH_2OCH_3$	CF_3	
2.134	$CH_2OCH_2CH(OCH_3)_2$	CF_3	
2.135	$CH_2OCH_2CH(OCH_2CH_3)_2$	CF_3	
2.136		CF_3	
2.137		CF_3	
2.138		CF_3	

Ex. No.	R_1	R_2	Physical properties
2.139		CF_3	
2.140		CF_3	
2.141		CF_3	
2.142		CF_3	
2.143		CF_3	
2.144		CF_3	
2.145		CF_3	
2.146	$CH_2OCH_2CH_2SCH_3$	CF_3	
2.147	$CH_2OCH_2CH_2SCH_2CH_3$	CF_3	
2.148	$CH_2OCH_2CH_2S(O)_2CH_3$	CF_3	
2.149	$CH_2OCH_2CH_2S(O)_2CH_2CH_3$	CF_3	
2.150	$CH_2SCH_2CH_2OCH_3$	CF_3	
2.151	$CH_2SCH_2CH_2OCH_2CH_3$	CF_3	
2.152	$CH_2OCH_2CH_2OC(O)CH_3$	CF_3	
2.153	$CH_2OCH_2CH_2OC(O)$-phenyl	CF_3	
2.154	$CH_2OCH_2CH_2OC(O)OCH_2CH_3$	CF_3	
2.155	$CH_2OCH_2CH_2OC(O)NHCH_2CH_3$	CF_3	
2.156	$CH_2OCH_2CH_2NH_2$	CF_3	
2.157	$CH_2OCH_2CH_2NHC(O)CH_3$	CF_3	
2.158	$CH_2OCH_2CH_2NHC(O)CH_2CH_3$	CF_3	

Ex. No.	R_1	R_2	Physical properties
2.159	$CH_2OCH_2CH_2NHC(O)CH(CH_3)_2$	CF_3	
2.160	$CH_2OCH_2CH_2NHC(O)$-cyclopropyl	CF_3	
2.161	$CH_2OCH_2CH_2NHC(O)C(CH_3)_3$	CF_3	
2.162	$CH_2OCH_2CH_2NHC(O)$-phenyl	CF_3	
2.163	$CH_2OCH_2CH_2NHC(O)OCH_3$	CF_3	
2.164	$CH_2OCH_2CH_2NHC(O)OCH_2CH_3$	CF_3	
2.165	$CH_2OCH_2CH_2NHC(O)NHCH_3$	CF_3	
2.166	$CH_2OCH_2CH_2NHC(O)NHCH_2CH_3$	CF_3	
2.167	$CH_2OCH_2CH_2NHC(O)N(CH_3)_2$	CF_3	
2.168	$CH_2OCH_2CH_2NHC(O)N(CH_2CH_3)_2$	CF_3	
2.169	$CH_2N(SO_2CH_3)CH_3$	CF_3	
2.170	$CH_2N(SO_2CH_3)CH_2CH_3$	CF_3	
2.171	$CH_2N(SO_2CH_2CH_3)CH_2CH_3$	CF_3	
2.172	$CH_2N(SO_2CH_3)CH_2CF_3$	CF_3	
2.173	$CH_2N(SO_2CH_3)CH_2CHOCH_3$	CF_3	
2.174	$CH_2N(SO_2CH_3)CH_2$-cyclopropyl	CF_3	
2.175	$CH_2N(SO_2CH_3)$-phenyl	CF_3	
2.176	$CH_2N(SO_2CH_3)$-benzyl	CF_3	
2.177	$CH_2N(SO_2CH_3)CH_2CH{=}CH_2$	CF_3	
2.178	$CH_2N(SO_2CH_3)CH_2C{\equiv}CH$	CF_3	
2.179	$CH_2N(CH_3)C(O)H$	CF_3	
2.180	$CH_2N(CH_3)C(O)CH_3$	CF_3	
2.181	$CH_2N(CH_3)C(O)CH_2CH_3$	CF_3	
2.182	$CH_2N(CH_3)C(O)$-phenyl	CF_3	
2.183	$CH_2N(CH_3)C(O)$-benzyl	CF_3	
2.184	$CH_2N(CH_2CH_3)C(O)CH_3$	CF_3	
2.185		CF_3	
2.186		CF_3	
2.187		CF_3	

Ex. No.	R_1	R_2	Physical properties
2.188	$C(OCH_2CH_3)=CH_2$	CF_3	waxy
2.189	$CH_2C(O)CH_3$	CF_3	
2.190	$C(OCH_3)_2$	CF_3	
2.191		CF_3	m.p.: 108-110°C
2.192	$CH_2C(O)CH_2OCH_3$	CF_3	
2.193	$CH_2C(O)CH_2OCH_2CH_2OCH_3$	CF_3	
2.194	$CH_2C(O)CH_2N(SO_2CH_3)CH_3$	CF_3	
2.195	$C(CH_2OCH_3)=CH_2$	CF_3	
2.196		CF_3	
2.197		CF_3	
2.198		CF_3	crystalline solid
2.199		CF_3	
2.200		CF_3	
2.201		CF_3	amorphous solid
2.202		CF_3	amorphous solid
2.203	CH_3	CF_3	
2.204	$C(O)CH_3$	CF_3	
2.205	$C(O)CH_2OCH_3$	CF_3	
2.206	$C(O)CH_2OCH_2CH_2OCH_3$	CF_3	
2.207	$C(O)CH_2N(SO_2CH_3)CH_3$	CF_3	
2.208	$C\equiv N$	CF_3	resin
2.209	CH_3	$C\equiv N$	resin

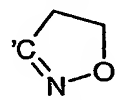
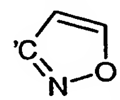
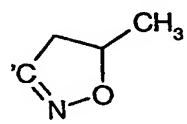
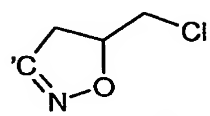
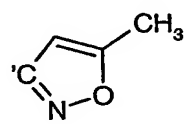
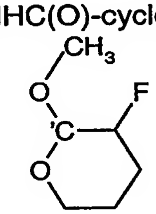
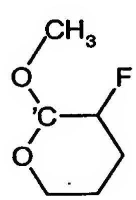
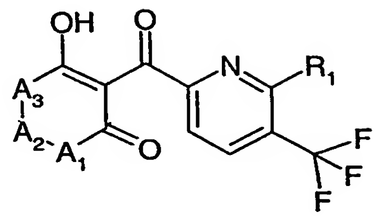
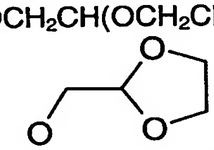
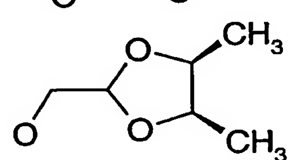
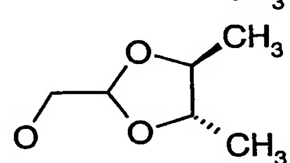
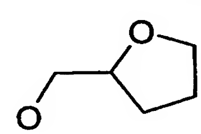
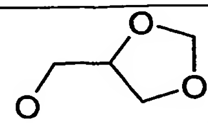
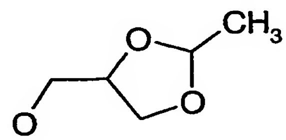
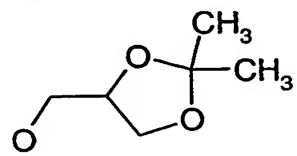
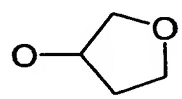
Ex. No.	R_1	R_2	Physical properties
2.210		CF_3	
2.211		CF_3	
2.212		CF_3	
2.213		CF_3	
2.214		CF_3	
2.215	$C(OCH_2CH_2CH_2CH_3)=CH_2$	CF_3	
2.216	$CH_2CH_2OCH_2CH_2CH_2CH_3$	CF_3	
2.217	CH_2O-phenyl	CF_3	
2.218	CH_2NHSO_2-phenyl	CF_3	
2.219	$CH_2N(SO_2CH_3)$-cyclopropyl	CF_3	
2.220	$CH_2N(SO_2CH_2CH_3)$-phenyl	CF_3	
2.221	$CH_2NHC(O)$-cyclopropyl	CF_3	
2.222		CF_3	isomer A (cis or trans), crystalline solid
2.223		CF_3	isomer B (cis or trans), crystalline solid

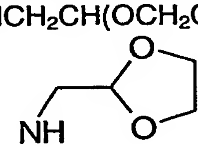
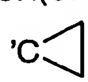
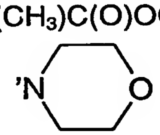
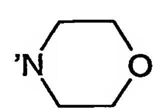
Table 3: Compounds of formula IC

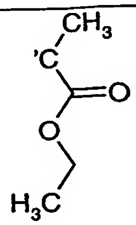
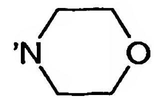
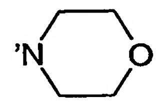
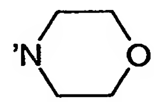
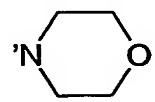
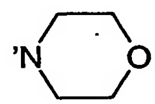
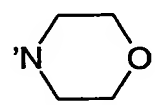
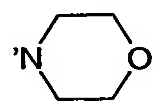
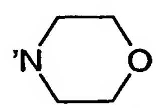
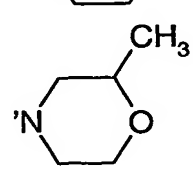
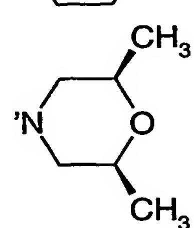


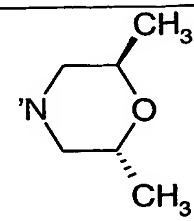
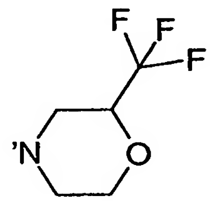
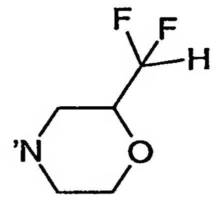
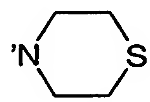
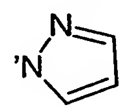
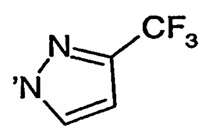
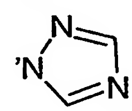
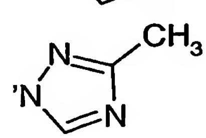
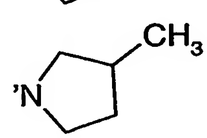
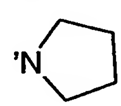
(IC)

Ex. No.	A_1	A_2	A_3	R_1	Physical properties
3.001	CH_2	CH_2	$CH(CH_3)$	OCH_2OCH_3	
3.002	CH_2	CH_2	$CH(CH_3)$	$OCH_2OCH_2CH_3$	
3.003	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2OCH_3$	
3.004	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2OCH_2CH_3$	
3.005	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2CH_2OCH_3$	
3.006	CH_2	CH_2	$CH(CH_3)$	$OCH(CH_3)CH_2OCH_3$	
3.007	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2OCH_2CH=CH_2$	
3.008	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2OCH_2C\equiv CH$	
3.009	CH_2	CH_2	$CH(CH_3)$	OCH_2CH_2O-benzyl	
3.010	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2ON=C(CH_3)_2$	
3.011	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2OCH_2CH_2OCH_3$	
3.012	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH(OCH_3)_2$	
3.013	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH(OCH_2CH_3)_2$	
3.014	CH_2	CH_2	$CH(CH_3)$		
3.015	CH_2	CH_2	$CH(CH_3)$		
3.016	CH_2	CH_2	$CH(CH_3)$		
3.017	CH_2	CH_2	$CH(CH_3)$		

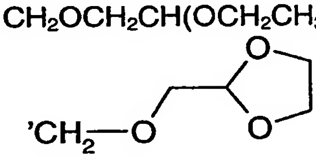
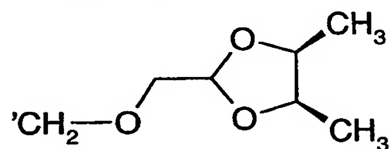
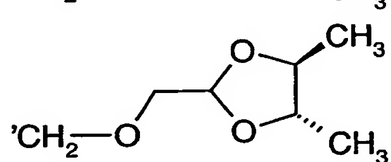
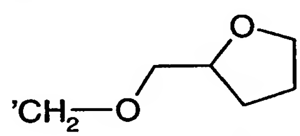
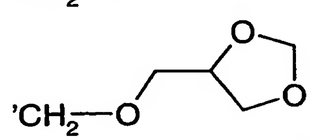
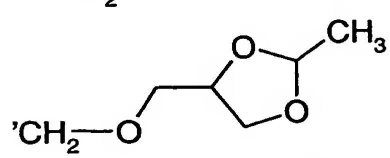
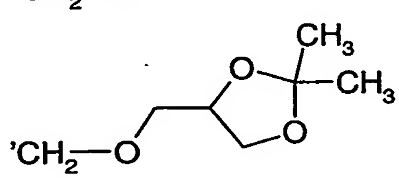
Ex. No.	A_1	A_2	A_3	R_1	Physical properties
3.018	CH_2	CH_2	$CH(CH_3)$		
3.019	CH_2	CH_2	$CH(CH_3)$		
3.020	CH_2	CH_2	$CH(CH_3)$		
3.021	CH_2	CH_2	$CH(CH_3)$		
3.022	CH_2	CH_2	$CH(CH_3)$	O-benzyl	
3.023	$CH(CH_3)$	CH_2	CH_2	$OCH_2CH_2SCH_3$	
3.024	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2SCH_2CH_3$	
3.025	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2S(O)_2CH_3$	
3.026	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2S(O)_2CH_2CH_3$	
3.027	CH_2	CH_2	$CH(CH_3)$	$SCH_2CH_2OCH_3$	
3.028	CH_2	CH_2	$CH(CH_3)$	$SCH_2CH_2OCH_2CH_3$	
3.029	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2OC(O)CH_3$	
3.030	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2OC(O)$-phenyl	
3.031	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2OC(O)OCH_2CH_3$	
3.032	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2OC(O)NHCH_2CH_3$	
3.033	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NH_2$	
3.034	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NHC(O)CH_3$	
3.035	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NHC(O)CH_2CH_3$	
3.036	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NHC(O)CH(CH_3)_2$	
3.037	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NHC(O)$-cyclopropyl	
3.038	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NHC(O)C(CH_3)_3$	
3.039	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NHC(O)$-phenyl	
3.040	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NHC(O)OCH_3$	
3.041	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NHC(O)OCH_2CH_3$	
3.042	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NHC(O)NHCH_3$	
3.043	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NHC(O)NHCH_2CH_3$	

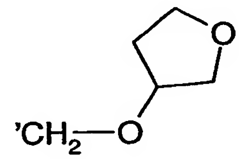
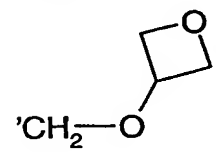
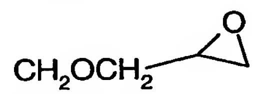
Ex. No.	A_1	A_2	A_3	R_1	Physical properties
3.044	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NHC(O)N(CH_3)_2$	
3.045	CH_2	CH_2	$CH(CH_3)$	$OCH_2CH_2NHC(O)N(CH_2CH_3)_2$	
3.046	CH_2	CH_2	$CH(CH_3)$	$NHCH_3$	
3.047	CH_2	CH_2	$CH(CH_3)$	$NHCH_2CH_3$	
3.048	CH_2	CH_2	$CH(CH_3)$	$NHCH_2CH_2CH_3$	
3.049	CH_2	CH_2	$CH(CH_3)$	$NHCH_2CH_2CH_2CH_3$	
3.050	CH_2	CH_2	$CH(CH_3)$	$NHCH(CH_3)_2$	
3.051	CH_2	CH_2	$CH(CH_3)$	$NHC(CH_3)_3$	
3.052	CH_2	CH_2	$CH(CH_3)$	$NHCH_2$-cyclopropyl	
3.053	CH_2	CH_2	$CH(CH_3)$	NH-phenyl	
3.054	CH_2	CH_2	$CH(CH_3)$	NH-benzyl	
3.055	CH_2	CH_2	$CH(CH_3)$	$N(CH_2CH_3)_2$	
3.056	CH_2	CH_2	$CH(CH_3)$	$N(CH_2CH_2CH_3)_2$	
3.057	CH_2	CH_2	$CH(CH_3)$	$N(CH_2CH_2CH_2CH_3)_2$	
3.058	CH_2	CH_2	$CH(CH_3)$	$NHCH_2CH_2OH$	
3.059	CH_2	CH_2	$CH(CH_3)$	$NHCH_2CH_2OCH_3$	
3.060	CH_2	CH_2	$CH(CH_3)$	$NHCH(CH_3)CH_3OCH_3$	
3.061	CH_2	CH_2	$CH(CH_3)$	$NHCH_2CH(OCH_3)_2$	
3.062	CH_2	CH_2	$CH(CH_3)$	$NHCH_2CH(OCH_2CH_3)_2$	
3.063	CH_2	CH_2	$CH(CH_3)$		
3.064	CH_2	CH_2	$CH(CH_3)$	$NHCH_2C(O)OCH_3$	
3.065	CH_2	CH_2	$CH(CH_3)$	$NHCH(CH_3)C(O)OCH_3$	
3.066	CH_2	CH_2	$CH(CH_3)$	$NHCH_2C(O)OCH_2CH_3$	
3.067	CH_2	CH_2	$CH(CH_3)$	$NHCH(CH_3)C(O)OCH_2CH_3$	
3.068	CH_2	CH_2			resin
3.069	CH_2	$CH(CH_3)$	CH_2		m.p.: 80-81°C

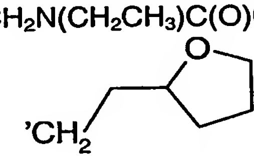
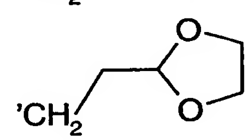
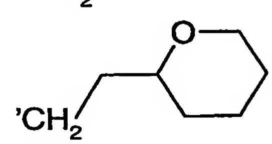
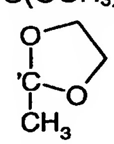
Ex. No.	A_1	A_2	A_3	R_1	Physical properties
3.070		CH_2	CH_2		resin
3.071	$CH(CH_3)$	CH_2	CH_2		resin
3.072	$C(CH_3)_2$	CH_2	CH_2		resin
3.073	$C(CH_3)_2$	$CH(CH_3)$	CH_2		resin
3.074	$C(CH_3)_2$	CH_2	$CH(CH_3)$		resin
3.075	$C(CH_3)_2$	CH_2	$C(CH_3)_2$		resin
3.076	$C(CH_3)_2$	O	$C(CH_3)_2$		resin
3.077	CH_2	$C(CH_3)_2$	CH_2		m.p.: 121-122°C
3.078	$CH(CH_3)$	CH_2	CH_2		
3.079	$CH(CH_3)$	CH_2	CH_2		

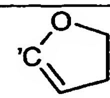
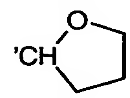
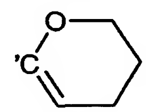
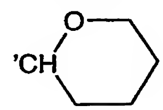
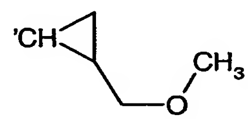
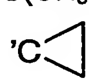
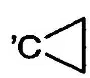
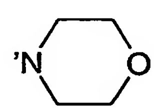
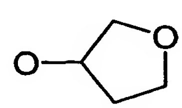
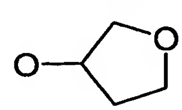
Ex. No.	A_1	A_2	A_3	R_1	Physical properties
3.080	$CH(CH_3)$	CH_2	CH_2		
3.081	$CH(CH_3)$	CH_2	CH_2		
3.082	$CH(CH_3)$	CH_2	CH_2		
3.083	$CH(CH_3)$	CH_2	CH_2		
3.084	$CH(CH_3)$	CH_2	CH_2		
3.085	$CH(CH_3)$	CH_2	CH_2		
3.086	$CH(CH_3)$	CH_2	CH_2		
3.087	$CH(CH_3)$	CH_2	CH_2		
3.088	$CH(CH_3)$	CH_2	CH_2		
3.089	$CH(CH_3)$	CH_2	CH_2		
3.090	$CH(CH_3)$	CH_2	CH_2	$N(CH_3)C(O)H$	

Ex. No.	A_1	A_2	A_3	R_1	Physical properties
3.091	$CH(CH_3)$	CH_2	CH_2	$N(CH_3)C(O)CH_3$	
3.092	$CH(CH_3)$	CH_2	CH_2	$N(CH_3)C(O)CH_2CH_3$	
3.093	$CH(CH_3)$	CH_2	CH_2	$N(CH_3)C(O)$-phenyl	
3.094	$CH(CH_3)$	CH_2	CH_2	$N(CH_3)C(O)$-benzyl	
3.095	$CH(CH_3)$	CH_2	CH_2	$N(CH_2CH_3)C(O)CH_3$	
3.096	CH_2	$CH(CH_3)$	CH_2	CH_2OH	
3.097	CH_2	$CH(CH_3)$	CH_2	CH_2Cl	
3.098	CH_2	$CH(CH_3)$	CH_2	CH_2Br	
3.099	CH_2	$CH(CH_3)$	CH_2	$CH_2OSO_2CH_3$	
3.100	CH_2	$CH(CH_3)$	CH_2	$CH_2OC(O)CH_3$	
3.101	CH_2	$CH(CH_3)$	CH_2	$CH_2OC(O)C(CH_3)_3$	
3.102	CH_2	$CH(CH_3)$	CH_2	$CH_2OC(O)$phenyl	
3.103	CH_2	$CH(CH_3)$	CH_2	$CH_2OC(O)OCH_2CH_3$	
3.104	CH_2	$CH(CH_3)$	CH_2	CH_2OCH_3	
3.105	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_3$	
3.106	CH_2	$CH(CH_3)$	CH_2	$CH_2CH_2OCH_3$	
3.107	CH_2	$CH(CH_3)$	CH_2	$CH_2CH_2OCH_2CH_3$	
3.108	CH_2	$CH(CH_3)$	CH_2	$CH_2CH_2CH_2OCH_3$	
3.109	CH_2	$CH(CH_3)$	CH_2	$CH(CH_3)CH_2OCH_3$	
3.110	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH{=}CH_2$	
3.111	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2C{\equiv}CH$	
3.112	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2C{\equiv}CCH_3$	
3.113	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2C{\equiv}CH$	
3.114	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2C{\equiv}CCH_3$	
3.115	CH_2	$CH(CH_3)$	CH_2	CH_2O-benzyl	
3.116	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CF_3$	
3.117	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2F$	
3.118	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2Cl$	
3.119	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2Br$	
3.120	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2C{\equiv}N$	
3.121	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2C{\equiv}N$	
3.122	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2OCH_3$	
3.123	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2OCH_2CH_3$	
3.124	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2OH$	

Ex. No.	A_1	A_2	A_3	R_1	Physical properties
3.125	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2OCH_3$	
3.126	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2OCH_2CH_3$	
3.127	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2CH_2OCH_3$	
3.128	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH(CH_3)CH_2OCH_3$	
3.129	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2OCH_2CH{=}CH_2$	
3.130	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2OCH_2C{\equiv}CH$	
3.131	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2O$-benzyl	
3.132	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2ON{=}C(CH_3)_2$	
3.133	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2OCH_2CH_2OCH_3$	
3.134	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH(OCH_3)_2$	
3.135	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH(OCH_2CH_3)_2$	
3.136	CH_2	$CH(CH_3)$	CH_2		
3.137	CH_2	$CH(CH_3)$	CH_2		
3.138	CH_2	$CH(CH_3)$	CH_2		
3.139	CH_2	$CH(CH_3)$	CH_2		
3.140	CH_2	$CH(CH_3)$	CH_2		
3.141	CH_2	$CH(CH_3)$	CH_2		
3.142	CH_2	$CH(CH_3)$	CH_2		

Ex. No.	A_1	A_2	A_3	R_1	Physical properties
3.143	CH_2	$CH(CH_3)$	CH_2		
3.144	CH_2	$CH(CH_3)$	CH_2		
3.145	CH_2	$CH(CH_3)$	CH_2		
3.146	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2SCH_3$	
3.147	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2SCH_2CH_3$	
3.148	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2S(O)_2CH_3$	
3.149	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2S(O)_2CH_2CH_3$	
3.150	CH_2	$CH(CH_3)$	CH_2	$CH_2SCH_2CH_2OCH_3$	
3.151	CH_2	$CH(CH_3)$	CH_2	$CH_2SCH_2CH_2OCH_2CH_3$	
3.152	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2OC(O)CH_3$	
3.153	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2OC(O)$-phenyl	
3.154	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2OC(O)OCH_2CH_3$	
3.155	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2OC(O)NHCH_2CH_3$	
3.156	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NH_2$	
3.157	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NHC(O)CH_3$	
3.158	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NHC(O)CH_2CH_3$	
3.159	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NHC(O)CH(CH_3)_2$	
3.160	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NHC(O)$-cyclopropyl	
3.161	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NHC(O)C(CH_3)_3$	
3.162	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NHC(O)$-phenyl	
3.163	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NHC(O)OCH_3$	
3.164	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NHC(O)OCH_2CH_3$	
3.165	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NHC(O)NHCH_3$	
3.166	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NHC(O)NHCH_2CH_3$	
3.167	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NHC(O)N(CH_3)_2$	
3.168	CH_2	$CH(CH_3)$	CH_2	$CH_2OCH_2CH_2NHC(O)N(CH_2CH_3)_2$	
3.169	CH_2	$CH(CH_3)$	CH_2	$CH_2N(SO_2CH_3)CH_3$	
3.170	CH_2	$CH(CH_3)$	CH_2	$CH_2N(SO_2CH_3)CH_2CH_3$	

Ex. No.	A_1	A_2	A_3	R_1	Physical properties
3.171	CH_2	$CH(CH_3)$	CH_2	$CH_2N(SO_2CH_2CH_3)CH_2CH_3$	
3.172	CH_2	$CH(CH_3)$	CH_2	$CH_2N(SO_2CH_3)CH_2CF_3$	
3.173	CH_2	$CH(CH_3)$	CH_2	$CH_2N(SO_2CH_3)CH_2CHOCH_3$	
3.174	CH_2	$CH(CH_3)$	CH_2	$CH_2N(SO_2CH_3)CH_2$-cyclopropyl	
3.175	CH_2	$CH(CH_3)$	CH_2	$CH_2N(SO_2CH_3)$-phenyl	
3.176	CH_2	$CH(CH_3)$	CH_2	$CH_2N(SO_2CH_3)$-benzyl	
3.177	CH_2	$CH(CH_3)$	CH_2	$CH_2N(SO_2CH_3)CH_2CH{=}CH_2$	
3.178	CH_2	$CH(CH_3)$	CH_2	$CH_2N(SO_2CH_3)CH_2C{\equiv}CH$	
3.179	CH_2	$CH(CH_3)$	CH_2	$CH_2N(CH_3)C(O)H$	
3.180	CH_2	$CH(CH_3)$	CH_2	$CH_2N(CH_3)C(O)CH_3$	
3.181	CH_2	$CH(CH_3)$	CH_2	$CH_2N(CH_3)C(O)CH_2CH_3$	
3.182	CH_2	$CH(CH_3)$	CH_2	$CH_2N(CH_3)C(O)$-phenyl	
3.183	CH_2	$CH(CH_3)$	CH_2	$CH_2N(CH_3)C(O)$-benzyl	
3.184	CH_2	$CH(CH_3)$	CH_2	$CH_2N(CH_2CH_3)C(O)CH_3$	
3.185	CH_2	$CH(CH_3)$	CH_2		
3.186	CH_2	$CH(CH_3)$	CH_2		
3.187	CH_2	$CH(CH_3)$	CH_2		
3.188	CH_2	$CH(CH_3)$	CH_2	$C(OCH_2CH_3){=}CH_2$	
3.189	CH_2	$CH(CH_3)$	CH_2	$CH_2C(O)CH_3$	
3.190	CH_2	$CH(CH_3)$	CH_2	$C(OCH_3)_2$	
3.191	CH_2	$CH(CH_3)$	CH_2		
3.192	CH_2	$CH(CH_3)$	CH_2	$CH_2C(O)CH_2OCH_3$	
3.193	CH_2	$CH(CH_3)$	CH_2	$CH_2C(O)CH_2OCH_2CH_2OCH_3$	
3.194	CH_2	$CH(CH_3)$	CH_2	$CH_2C(O)CH_2N(SO_2CH_3)CH_3$	
3.195	CH_2	$CH(CH_3)$	CH_2	$C(CH_2OCH_3){=}CH_2$	

Ex. No.	A_1	A_2	A_3	R_1	Physical properties
3.196	CH_2	$CH(CH_3)$	CH_2		
3.197	CH_2	$CH(CH_3)$	CH_2		
3.198	CH_2	$CH(CH_3)$	CH_2		
3.199	CH_2	$CH(CH_3)$	CH_2		
3.200	CH_2	$CH(CH_3)$	CH_2		
3.201	CH_2	$CH(CH_3)$	CH_2	Cl	resin
3.202	CH_2	$CH(CH_3)$	CH_2	CH_3	resin
3.203	CH_2	$CH(CH_3)$	CH_2	OCH_2CH_3	resin
3.204	CH_2	CH_2	$C(CH_3)_2$	CH_3	resin
3.205	CH_2	CH_2	$C(CH_3)_2$	OCH_2CH_3	resin
3.206	CH_2	$CH(CH_3)$	$C(CH_3)_2$	CH_3	resin
3.207	CH_2	$CH(CH_3)$	$C(CH_3)_2$	OCH_2CH_3	resin
3.208	$CH(CH_3)$	CH_2	$C(CH_3)_2$	CH_3	resin
3.209	$CH(CH_3)$	CH_2	$C(CH_3)_2$	OCH_2CH_3	resin
3.210	CH_2	CH_2		CH_3	resin
3.211	CH_2	CH_2		OCH_2CH_3	resin
3.212	CH_2	$CH(C{\equiv}N)$	CH_2		resin
3.213	CH_2	$CH(CH_3)$	CH_2		resin
3.214	$C(CH_3)_2$	CH_2	CH_2		resin

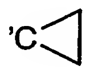
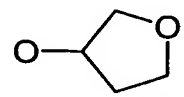
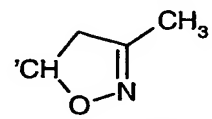
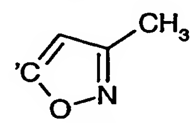
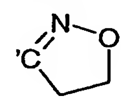
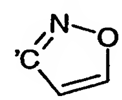
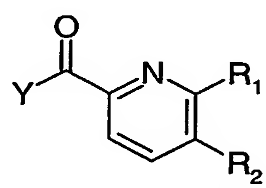
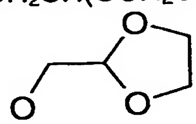
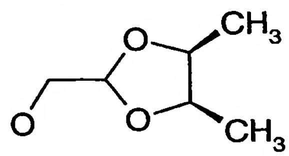
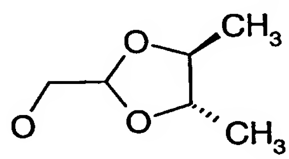
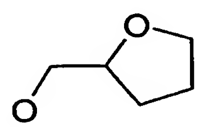
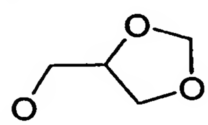
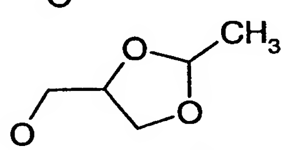
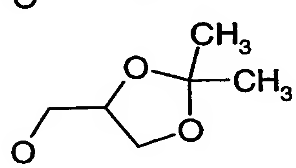
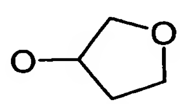
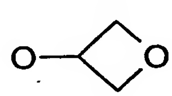
Ex. No.	A_1	A_2	A_3	R_1	Physical properties
3.215		CH_2	CH_2		resin
3.216	CH_2	$CH(CH_3)$	CH_2		
3.217	CH_2	$CH(CH_3)$	CH_2		
3.218	CH_2	$CH(CH_3)$	CH_2		
3.219	CH_2	$CH(CH_3)$	CH_2		
3.220	CH_2	$CH(CH_3)$	CH_2	$C(OCH_2CH_2CH_2CH_3)=CH_2$	
3.221	CH_2	$CH(CH_3)$	CH_2	$CH_2CH_2OCH_2CH_2CH_2CH_3$	

Table Z1: Intermediates of formula II

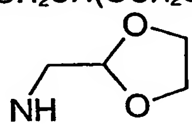
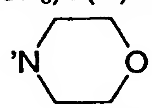
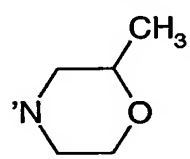
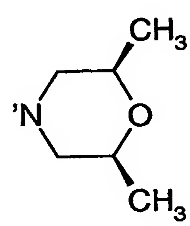
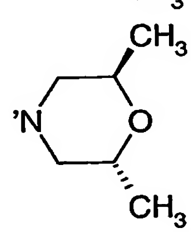
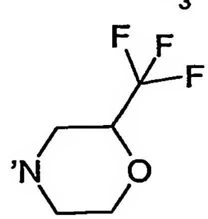
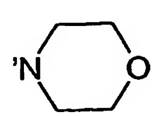


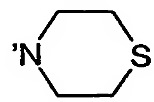
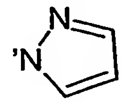
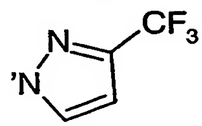
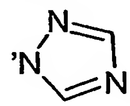
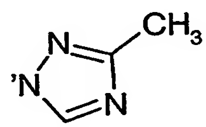
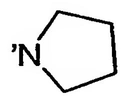
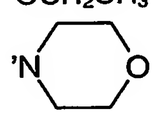
(II)

Ex. No.	Y	R_1	R_2	Physical properties
Z1.001	OH	OCH_2OCH_3	CF_3	
Z1.002	OH	$OCH_2OCH_2CH_3$	CF_3	
Z1.003	OH	$OCH_2CH_2OCH_3$	CF_3	m.p.: 66-67°C
Z1.004	OH	$OCH_2CH_2OCH_2CH_3$	CF_3	
Z1.005	OH	$OCH_2CH_2CH_2OCH_3$	CF_3	
Z1.006	OH	$OCH(CH_3)CH_2OCH_3$	CF_3	
Z1.007	OH	$OCH_2CH_2OCH_2CH=CH_2$	CF_3	
Z1.008	OH	$OCH_2CH_2OCH_2C\equiv CH$	CF_3	
Z1.009	OH	OCH_2CH_2O-benzyl	CF_3	
Z1.010	OH	$OCH_2CH_2ON=C(CH_3)_2$	CF_3	m.p.: 106-107°C

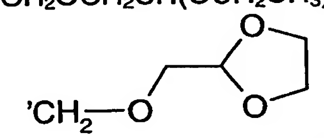
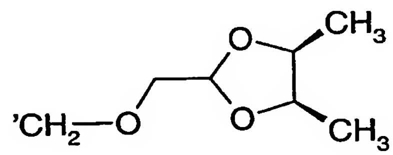
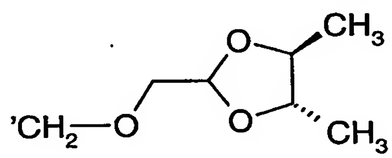
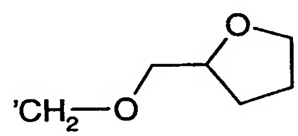
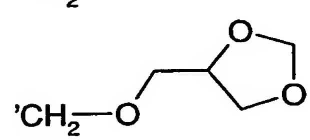
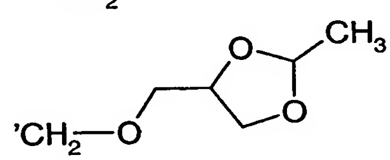
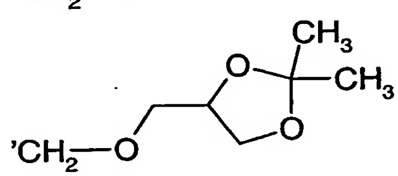
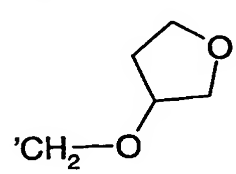
Ex. No.	Y	R_1	R_2	Physical properties
Z1.011	OH	$OCH_2CH_2OCH_2CH_2OCH_3$	CF_3	
Z1.012	OH	$OCH_2CH(OCH_3)_2$	CF_3	m.p.: 53-54°C
Z1.013	OH	$OCH_2CH(OCH_2CH_3)_2$	CF_3	
Z1.014	OH		CF_3	amorphous
Z1.015	OH		CF_3	
Z1.016	OH		CF_3	
Z1.017	OH		CF_3	
Z1.018	OH		CF_3	
Z1.019	OH		CF_3	
Z1.020	OH		CF_3	
Z1.021	OH		CF_3	m.p.: 124-125°C
Z1.022	OH		CF_3	waxy
Z1.023	OH	O-benzyl	CF_3	m.p.: 96-97°C
Z1.024	OH	$OCH_2CH_2SCH_3$	CF_3	
Z1.025	OH	$OCH_2CH_2SCH_2CH_3$	CF_3	
Z1.026	OH	$OCH_2CH_2S(O)_2CH_3$	CF_3	
Z1.027	OH	$OCH_2CH_2S(O)_2CH_2CH_3$	CF_3	
Z1.028	OH	$SCH_2CH_2OCH_3$	CF_3	

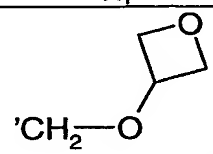
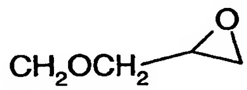
Ex. No.	Y	R_1	R_2	Physical properties
Z1.029	OH	$SCH_2CH_2OCH_2CH_3$	CF_3	
Z1.030	OH	$OCH_2CH_2OC(O)CH_3$	CF_3	
Z1.031	OH	$OCH_2CH_2OC(O)$-phenyl	CF_3	
Z1.032	OH	$OCH_2CH_2OC(O)OCH_2CH_3$	CF_3	
Z1.033	OH	$OCH_2CH_2OC(O)NHCH_2CH_3$	CF_3	
Z1.034	OH	$OCH_2CH_2NH_2$	CF_3	
Z1.035	OH	$OCH_2CH_2NHC(O)CH_3$	CF_3	
Z1.036	OH	$OCH_2CH_2NHC(O)CH_2CH_3$	CF_3	
Z1.037	OH	$OCH_2CH_2NHC(O)CH(CH_3)_2$	CF_3	
Z1.038	OH	$OCH_2CH_2NHC(O)$-cyclopropyl	CF_3	
Z1.039	OH	$OCH_2CH_2NHC(O)C(CH_3)_3$	CF_3	
Z1.040	OH	$OCH_2CH_2NHC(O)$-phenyl	CF_3	
Z1.041	OH	$OCH_2CH_2NHC(O)OCH_3$	CF_3	
Z1.042	OH	$OCH_2CH_2NHC(O)OCH_2CH_3$	CF_3	m.p.: 118-119°C
Z1.043	OH	$OCH_2CH_2NHC(O)NHCH_3$	CF_3	
Z1.044	OH	$OCH_2CH_2NHC(O)NHCH_2CH_3$	CF_3	
Z1.045	OH	$OCH_2CH_2NHC(O)N(CH_3)_2$	CF_3	
Z1.046	OH	$OCH_2CH_2NHC(O)N(CH_2CH_3)_2$	CF_3	
Z1.047	OH	$NHCH_3$	CF_3	
Z1.048	OH	$NHCH_2CH_3$	CF_3	
Z1.049	OH	$NHCH_2CH_2CH_3$	CF_3	
Z1.050	OH	$NHCH_2CH_2CH_2CH_3$	CF_3	
Z1.051	OH	$NHCH(CH_3)_2$	CF_3	
Z1.052	OH	$NHC(CH_3)_3$	CF_3	
Z1.053	OH	$NHCH_2$-cyclopropyl	CF_3	
Z1.054	OH	NH-phenyl	CF_3	
Z1.055	OH	NH-benzyl	CF_3	
Z1.056	OH	$NH-CH_2CH{=}CH_2$	CF_3	
Z1.057	OH	$NHCH_2C{\equiv}CH$	CF_3	
Z1.058	OH	$N(CH_2CH{=}CH_2)_2$	CF_3	
Z1.059	OH	$N(CH_2C{\equiv}CH)_2$	CF_3	
Z1.060	OH	$N(CH_3)_2$	CF_3	m.p.: 53-54°C
Z1.061	OH	$N(CH_2CH_3)_2$	CF_3	viscous oil
Z1.062	OH	$N(CH_2CH_2CH_3)_2$	CF_3	
Z1.063	OH	$N(CH_2CH_2CH_2CH_3)_2$	CF_3	

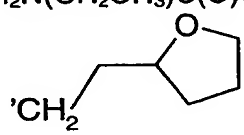
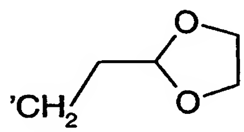
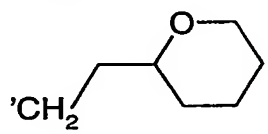
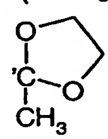
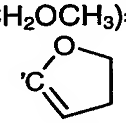
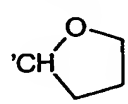
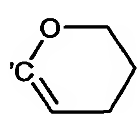
Ex. No.	Y	R_1	R_2	Physical properties
Z1.064	OH	$NHCH_2CH_2OH$	CF_3	
Z1.065	OEt	$NHCH_2CH_2OCH_3$	CF_3	oil
Z1.066	OH	$NHCH(CH_3)CH_3OCH_3$	CF_3	
Z1.067	OH	$NHCH_2CH(OCH_3)_2$	CF_3	
Z1.068	OH	$NHCH_2CH(OCH_2CH_3)_2$	CF_3	
Z1.069	OH		CF_3	
Z1.070	OH	$NHCH_2C(O)OCH_3$	CF_3	
Z1.071	OH	$NHCH(CH_3)C(O)OCH_3$	CF_3	
Z1.072	OH	$NHCH_2C(O)OCH_2CH_3$	CF_3	
Z1.073	OH	$NHCH(CH_3)C(O)OCH_2CH_3$	CF_3	
Z1.074	OH		CF_3	m.p.: 115-116°C, [P5]
Z1.075	OH		CF_3	
Z1.076	OH		CF_3	m.p.: 127-128°C
Z1.077	OH		CF_3	
Z1.078	OH		CF_3	
Z1.079	OH		CHF_2	

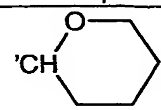
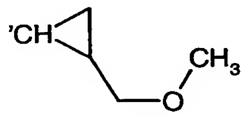
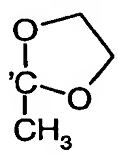
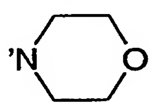
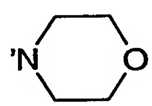
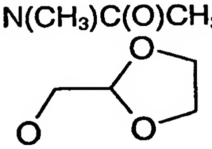
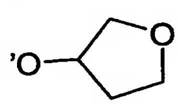
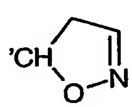
Ex. No.	Y	R_1	R_2	Physical properties
Z1.080	OH		CF_3	m.p.: 103-104°C
Z1.081	OH		CF_3	
Z1.082	OH		CF_3	amorphous
Z1.083	OH		CF_3	
Z1.084	OH		CF_3	
Z1.085	OH		CF_3	
Z1.086	OH	$N(CH_3)C(O)H$	CF_3	
Z1.087	OH	$N(CH_3)C(O)CH_3$	CF_3	m.p.: 164-165°C
Z1.088	OH	$N(CH_3)C(O)CH_2CH_3$	CF_3	m.p.: 76-77°C
Z1.089	OH	$N(CH_3)C(O)$-phenyl	CF_3	m.p.: 137-138°C
Z1.090	OH	$N(CH_3)C(O)$-benzyl	CF_3	m.p.: 154-156°C
Z1.091	OH	$N(CH_2CH_3)C(O)CH_3$	CF_3	
Z1.092	OH	OH	CF_3	m.p.: 220°C
Z1.093	OH	Cl	CF_3	m.p.: 166-167°C
Z1.094	OH	OCH_3	CF_3	m.p.: 139-140°C
Z1.095	OH	OCH_2CH_3	CF_3	m.p.: 112-114°C
Z1.096	OH		OCH_2CF_3	m.p.: 133-134°C
Z1.097	OEt	OH	CF_3	m.p.: 141-141.5°C, [P2]
Z1.098	OEt	SCH_3	CF_3	oil
Z1.099	OEt	OCH_3	CF_3	m.p.: 71-73°C
Z1.100	OEt	OCH_2CF_3	CF_3	oil
Z1.101	OEt	Cl	CF_3	oil, [P3]
Z1.102	OEt	CH_3	CF_3	oil, [P10]
Z1.103	OEt	CH_2Br	CF_3	oil, [P11]

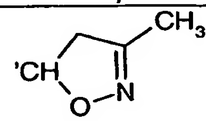
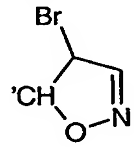
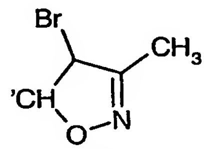
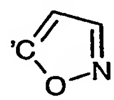
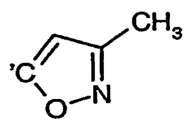
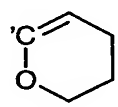
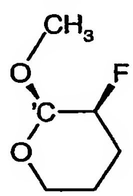
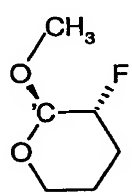
Ex. No.	Y	R_1	R_2	Physical properties
Z1.104	OEt	$CHBr_2$	CF_3	
Z1.105	OEt	C(=O)H	CF_3	
Z1.106	OH	CH_2OH	CF_3	
Z1.107	OEt	CH_2Cl	CF_3	
Z1.108	OEt	$CH_2OSO_2CH_3$	CF_3	
Z1.109	OH	$CH_2OC(O)CH_3$	CF_3	
Z1.110	OH	$CH_2OC(O)C(CH_3)_3$	CF_3	
Z1.111	OH	$CH_2OC(O)$phenyl	CF_3	
Z1.112	OH	$CH_2OC(O)OCH_2CH_3$	CF_3	
Z1.113	OH	CH_2OCH_3	CF_3	
Z1.114	OH	$CH_2OCH_2CH_3$	CF_3	
Z1.115	OH	$CH_2CH_2OCH_3$	CF_3	
Z1.116	OH	$CH_2CH_2OCH_2CH_3$	CF_3	
Z1.117	OH	$CH_2CH_2CH_2OCH_3$	CF_3	
Z1.118	OH	$CH(CH_3)CH_2OCH_3$	CF_3	
Z1.119	OH	$CH_2OCH_2CH=CH_2$	CF_3	
Z1.120	OH	$CH_2OCH_2C{\equiv}CH$	CF_3	
Z1.121	OH	$CH_2OCH_2C{\equiv}CCH_3$	CF_3	
Z1.122	OH	$CH_2OCH_2CH_2C{\equiv}CH$	CF_3	
Z1.123	OH	$CH_2OCH_2CH_2C{\equiv}CCH_3$	CF_3	
Z1.124	OH	CH_2O-benzyl	CF_3	
Z1.125	OH	$CH_2OCH_2CF_3$	CF_3	
Z1.126	OH	$CH_2OCH_2CH_2F$	CF_3	
Z1.127	OH	$CH_2OCH_2CH_2Cl$	CF_3	
Z1.128	OH	$CH_2OCH_2CH_2Br$	CF_3	
Z1.129	OH	$CH_2OCH_2CH_2C{\equiv}N$	CF_3	
Z1.130	OH	$CH_2OCH_2C{\equiv}N$	CF_3	
Z1.131	OH	$CH_2OCH_2OCH_3$	CF_3	
Z1.132	OH	$CH_2OCH_2OCH_2CH_3$	CF_3	
Z1.133	OH	$CH_2OCH_2CH_2OH$	CF_3	
Z1.134	OH	$CH_2OCH_2CH_2OCH_3$	CF_3	waxy crystals
Z1.135	OH	$CH_2OCH_2CH_2OCH_2CH_3$	CF_3	
Z1.136	OH	$CH_2OCH_2CH_2CH_2OCH_3$	CF_3	
Z1.137	OH	$CH_2OCH(CH_3)CH_2OCH_3$	CF_3	
Z1.138	OH	$CH_2OCH_2CH_2OCH_2CH=CH_2$	CF_3	

Ex. No.	Y	R_1	R_2	Physical properties
Z1.139	OH	$CH_2OCH_2CH_2OCH_2C{\equiv}CH$	CF_3	
Z1.140	OH	$CH_2OCH_2CH_2O$-benzyl	CF_3	
Z1.141	OH	$CH_2OCH_2CH_2ON{=}C(CH_3)_2$	CF_3	
Z1.142	OH	$CH_2OCH_2CH_2OCH_2CH_2OCH_3$	CF_3	
Z1.143	OH	$CH_2OCH_2CH(OCH_3)_2$	CF_3	
Z1.144	OH	$CH_2OCH_2CH(OCH_2CH_3)_2$	CF_3	
Z1.145	OH		CF_3	
Z1.146	OH		CF_3	
Z1.147	OH		CF_3	
Z1.148	OH		CF_3	
Z1.149	OH		CF_3	
Z1.150	OH		CF_3	
Z1.151	OH		CF_3	
Z1.152	OH		CF_3	

Ex. No.	Y	R_1	R_2	Physical properties
Z1.153	OH		CF_3	
Z1.154	OH		CF_3	
Z1.155	OH	$CH_2OCH_2CH_2SCH_3$	CF_3	
Z1.156	OH	$CH_2OCH_2CH_2SCH_2CH_3$	CF_3	
Z1.157	OH	$CH_2OCH_2CH_2S(O)_2CH_3$	CF_3	
Z1.158	OH	$CH_2OCH_2CH_2S(O)_2CH_2CH_3$	CF_3	
Z1.159	OH	$CH_2SCH_2CH_2OCH_3$	CF_3	
Z1.160	OH	$CH_2SCH_2CH_2OCH_2CH_3$	CF_3	
Z1.161	OH	$CH_2OCH_2CH_2OC(O)CH_3$	CF_3	
Z1.162	OH	$CH_2OCH_2CH_2OC(O)$-phenyl	CF_3	
Z1.163	OH	$CH_2OCH_2CH_2OC(O)OCH_2CH_3$	CF_3	
Z1.164	OH	$CH_2OCH_2CH_2OC(O)NHCH_2CH_3$	CF_3	
Z1.165	OH	$CH_2OCH_2CH_2NH_2$	CF_3	
Z1.166	OH	$CH_2OCH_2CH_2NHC(O)CH_3$	CF_3	
Z1.167	OH	$CH_2OCH_2CH_2NHC(O)CH_2CH_3$	CF_3	
Z1.168	OH	$CH_2OCH_2CH_2NHC(O)CH(CH_3)_2$	CF_3	
Z1.169	OH	$CH_2OCH_2CH_2NHC(O)$-cyclopropyl	CF_3	
Z1.170	OH	$CH_2OCH_2CH_2NHC(O)C(CH_3)_3$	CF_3	
Z1.171	OH	$CH_2OCH_2CH_2NHC(O)$-phenyl	CF_3	
Z1.172	OH	$CH_2OCH_2CH_2NHC(O)OCH_3$	CF_3	
Z1.173	OH	$CH_2OCH_2CH_2NHC(O)OCH_2CH_3$	CF_3	
Z1.174	OH	$CH_2OCH_2CH_2NHC(O)NHCH_3$	CF_3	
Z1.175	OH	$CH_2OCH_2CH_2NHC(O)NHCH_2CH_3$	CF_3	
Z1.176	OH	$CH_2OCH_2CH_2NHC(O)N(CH_3)_2$	CF_3	
Z1.177	OH	$CH_2OCH_2CH_2NHC(O)N(CH_2CH_3)_2$	CF_3	
Z1.178	OH	$CH_2N(SO_2CH_3)CH_3$	CF_3	
Z1.179	OH	$CH_2N(SO_2CH_3)CH_2CH_3$	CF_3	
Z1.180	OH	$CH_2N(SO_2CH_2CH_3)CH_2CH_3$	CF_3	
Z1.181	OH	$CH_2N(SO_2CH_3)CH_2CF_3$	CF_3	
Z1.182	OH	$CH_2N(SO_2CH_3)CH_2CHOCH_3$	CF_3	
Z1.183	OH	$CH_2N(SO_2CH_3)CH_2$-cyclopropyl	CF_3	
Z1.184	OH	$CH_2N(SO_2CH_3)$-phenyl	CF_3	

Ex. No.	Y	R_1	R_2	Physical properties
Z1.185	OH	$CH_2N(SO_2CH_3)$-benzyl	CF_3	
Z1.186	OH	$CH_2N(SO_2CH_3)CH_2CH{=}CH_2$	CF_3	
Z1.187	OH	$CH_2N(SO_2CH_3)CH_2C{\equiv}CH$	CF_3	
Z1.188	OH	$CH_2N(CH_3)C(O)H$	CF_3	
Z1.189	OH	$CH_2N(CH_3)C(O)CH_3$	CF_3	
Z1.190	OH	$CH_2N(CH_3)C(O)CH_2CH_3$	CF_3	
Z1.191	OH	$CH_2N(CH_3)C(O)$-phenyl	CF_3	
Z1.192	OH	$CH_2N(CH_3)C(O)$-benzyl	CF_3	
Z1.193	OH	$CH_2N(CH_2CH_3)C(O)CH_3$	CF_3	
Z1.194	OH		CF_3	
Z1.195	OH		CF_3	
Z1.196	OH		CF_3	
Z1.197	OH	$C(OCH_2CH_3){=}CH_2$	CF_3	amorphous solid
Z1.198	OH	$CH_2C(O)CH_3$	CF_3	
Z1.199	OH	$C(OCH_3)_2$	CF_3	
Z1.200	OH		CF_3	amorphous solid
Z1.201	OH	$CH_2C(O)CH_2OCH_3$	CF_3	
Z1.202	OH	$CH_2C(O)CH_2OCH_2CH_2OCH_3$	CF_3	
Z1.203	OH	$CH_2C(O)CH_2N(SO_2CH_3)CH_3$	CF_3	
Z1.204	OH	$C(CH_2OCH_3){=}CH_2$	CF_3	
Z1.205	OH		CF_3	
Z1.206	OH		CF_3	
Z1.207	OH		CF_3	amorphous solid

Ex. No.	Y	R_1	R_2	Physical properties
Z1.208	OH		CF_3	
Z1.209	OH		CF_3	
Z1.210	OH	$C(O)CH_3$	CF_3	
Z1.211	OH	$C(O)CH_2OCH_3$	CF_3	
Z1.212	OH	$C(O)CH_2OCH_2CH_2OCH_3$	CF_3	
Z1.213	OH	$C(O)CH_2N(SO_2CH_3)CH_3$	CF_3	
Z1.214	OH	$COOCH_3$	CF_3	
Z1.215	OH	$COOCH_2CH_3$	CF_3	
Z.1.216	OH	CH_3	CF_3	m.p.: 82-83°C
Z1.217	OH	benzylthio	$OCHF_2$	m.p.: 132-133°C
Z1.218	OH	Cl	OCH_2CF_3	m.p.: 131-133°C
Z1.219	OH	C≡N	CF_3	m.p.: 122-123°C
Z1.220	OH	CH_3	C≡N	m.p.: 157-158°C
Z1.221	OH	CF_3	Cl	m.p.: 127-129°C
Z1.222	OEt		CF_3	waxy
Z1.223	OEt		CF_3	oil, [P4]
Z1.224	Cl		CF_3	m.p.: 72-73°C, [P6]
Z1.225	OEt	$N(CH_3)C(O)CH_3$	CF_3	m.p.: 145-145.5°C, [P7]
Z1.226	OEt		CF_3	oil, [P8]
Z1.227	OEt		CF_3	m.p.: 45-45.5°C, [P9]
Z1.228	OEt		CF_3	oil

Ex. No.	Y	R1	R2	Physical properties
Z1.229	OH		CF_3	amorphous solid
Z1.230	OEt		CF_3	oil
Z1.231	OEt		CF_3	oil
Z1.232	OH		CF_3	solid
Z1.233	OH		CF_3	amorphous solid
Z1.234	OEt		CF_3	oil
Z1.235	OEt		CF_3	oil, isomer I
Z1.236	OEt		CF_3	oil, isomer II
Z1.237	OEt	$CH=CH_2$	CF_3	oil, [P16]
Z1.238	OEt	$C(OCH_2CH_3)=CH_2$	CF_3	oil, [P17]
Z1.239	OEt	$C(OCH_2CH_2CH_2CH_3)=CH_2$	CF_3	
Z1.240	OEt	$CH=CHOCH_2CH_3$	CF_3	
Z1.241	OEt	$CH=CHOCH_2CH_2CH_2CH_3$	CF_3	
Z1.242	OEt	$C(O)CH_2Br$	CF_3	oil
Z1.243	OEt	$C(O)CH_2OH$	CF_3	oil
Z1.244	OEt	$CH_2CH_2OCH_2CH_3$	CF_3	
Z1.245	OH	$CH_2CH_2OCH_2CH_2CH_2CH_3$	CF_3	

Ex. No.	Y	R_1	R_2	Physical properties
Z1.246	OH	CH_2O-phenyl	CF_3	
Z1.247	OH	CH_2NHSO_2-phenyl	CF_3	
Z1.248	OH	$CH_2N(SO_2CH_3)$-cyclopropyl	CF_3	
Z1.249	OH	$CH_2N(SO_2CH_2CH_3)$-phenyl	CF_3	
Z1.250	OH	$CH_2NHC(O)$-cyclopropyl	CF_3	
Z1.251	OH	$CH_2NHC(O)$-phenyl	CF_3	

Biological Examples

Example B1: Herbicidal action prior to emergence of the plants (pre-emergence action)

Monocotyledonous and dicotyledonous test plants are sown in standard soil in pots or seed trays. Immediately after sowing, the test compounds, in the form of an aqueous suspension (prepared from a wettable powder (Example F3, b) according to WO 97/34485) or in the form of an emulsion (prepared from an emulsifiable concentrate (Example F1, c) according to WO 97/34485), are applied by spraying in a concentration of 250 g/ha. The test plants are then grown in a greenhouse under optimum conditions. After a test duration of 4 weeks, the test is evaluated in accordance with a scale of eleven ratings (10 = total damage, 0 = no action). Ratings of from 10 to 7 (especially from 10 to 8) indicate very good to good herbicidal action.

Table B1: Pre-emergence action:

Ex. No.	g/ha	*Panicum*	*Digitaria*	*Echinochloa*	*Scirpus*	*Abutilon*	*Amaranthus*	*Chenopodium*
1.012	250	10	9	5	7	10	5	0
1.073	250	10	10	10	nt	10	6	10
1.075	250	10	10	10	7	9	10	9
1.079	250	10	10	10	4	10	10	9
1.126	250	9	6	2	8	10	10	10
2.021	250	9	3	0	7	9	7	9
2.059	250	7	7	8	nt	10	7	9
2.073	250	10	7	9	4	9	9	9
2.078	250	10	10	10	0	10	8	10

Ex. No.	g/ha	*Panicum*	*Digitaria*	*Echinochloa*	*Scirpus*	*Abutilon*	*Amaranthus*	*Chenopodium*
2.088	250	9	9	7	0	9	nt	7
2.089	250	9	8	8	nt	9	8	0
2.191	250	10	7	10	3	10	7	9
2.203	250	6	5	9	8	10	9	nt
2.209	250	10	8	10	2	10	9	9
3.069	250	10	10	10	5	10	10	6
3.071	250	10	10	10	8	9	8	6
3.072	250	9	10	10	7	9	3	8
3.073	250	10	9	7	7	5	0	7

Example B2: Post-emergence herbicidal action

Monocotyledonous and dicotyledonous test plants are cultivated in a greenhouse in standard soil in plastic pots and, at the 4- to 6-leaf stage, are sprayed with an aqueous suspension of the test compounds of formula I prepared from a 25 % wettable powder (Example F3, b) according to WO 97/34485) or with an emulsion of the test compounds of formula I prepared from a 25 % emulsifiable concentrate (Example F1, c) according to WO 97/34485), corresponding to concentrations of 125 and 250 g of active ingredient per hectare (500 litres of water per ha). The test plants are then grown on in the greenhouse under optimum conditions. After a test duration of about 18 days, the test is evaluated in accordance with a scale of eleven ratings (10 = total damage, 0 = no action). Ratings of from 10 to 7 (especially from 10 to 8) indicate very good to good herbicidal action. The compounds of formula I generally exhibit a strong herbicidal action in this test.

Table B2: Post-emergence action

Ex. No.	g/ha	*Panicum*	*Echinochloa*	*Euphorbia*	*Xanthium*	*Amaranthus*	*Chenopodium*	*Stellaria*
1.003	250	8	8	6	9	9	10	10
1.012	250	7	8	9	8	9	8	7
1.021	250	6	6	7	9	9	8	7
1.073	250	10	9	9	9	10	8	9

Ex. No.	g/ha	*Panicum*	*Echino-chloa*	*Euphorbia*	*Xanthium*	*Ama-ranthus*	*Cheno-podium*	*Stellaria*
1.075	250	10	8	8	7	10	10	8
1.079	250	3	7	8	7	8	10	10
1.081	250	10	9	9	9	10	9	6
1.090	250	8	7	nt	8	8	9	6
1.126	250	7	7	8	8	8	8	8
1.203	250	9	8	7	8	8	9	7
2.003	250	9	9	9	8	8	8	9
2.021	250	9	9	9	8	9	8	7
2.059	250	5	8	6	7	7	10	8
2.073	250	9	9	9	9	9	8	7
2.078	250	5	8	7	7	7	10	10
2.080	250	9	9	9	9	9	6	7
2.089	250	8	7	8	7	0	9	8
2.094	250	8	8	8	7	3	9	9
2.095	250	9	9	9	9	9	8	5
2.188	250	9	7	7	8	5	6	10
2.191	250	9	8	8	8	3	7	10
2.203	250	9	9	9	9	6	6	9
2.208	250	9	9	8	8	8	6	5
2.209	250	9	8	8	9	8	6	10
2.201	250	9	8	6	8	9	8	6
3.068	250	10	9	9	9	10	9	9
3.069	250	8	7	5	8	8	10	7
3.070	250	7	8	7	5	7	9	5
3.071	250	9	8	7	8	8	10	8
3.072	250	8	7	7	8	7	9	8
3.073	250	7	8	7	7	4	9	7

Ex. No.	g/ha	*Panicum*	*Echino-chloa*	*Euphorbia*	*Xanthium*	*Ama-ranthus*	*Cheno-podium*	*Stellaria*
3.074	250	7	7	7	8	2	9	8
3.075	250	5	7	7	8	2	9	8
3.076	250	7	7	6	8	7	9	7
3.212	250	0	5	7	8	8	7	7

Example B3: Microscreen, post-emergence herbicidal action

Monocotyledonous and dicotyledonous test plants are sown in sterilised standard soil in seed trays each having 96 cells. After 8 to 9 days' cultivation under controlled conditions in a climatic chamber (cultivation at 17/23°C; 13 hours' light; 50-60 % humidity; after application at 19/24°C), the plants are treated with an aqueous spray solution of 1000 mg/l of the active ingredient used (rate of application: 500 g/l; incl. 10 % DMSO as solvent). The plants are grown on in the climatic chamber until the test is evaluated after 9 or 13 days. The test is evaluated in accordance with a scale of eleven ratings (10 = total damage, 0 = no action). Ratings of from 10 to 7 (especially from 10 to 8) indicate very good to good herbicidal action. The compounds of formula I generally exhibit a strong herbicidal action in this test.

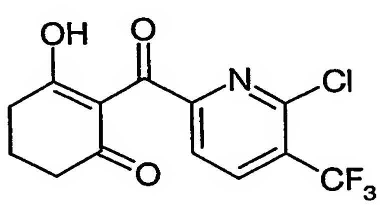
Table B3:

Ex. No.	g/ha	*Digitaria*	*Amaranthus*	*Solanum*	*Nasturtium*	*Stellaria*
1.059	250	7	7	9	9	9
1.060	250	4	8	8	9	7
1.080	250	5	7	9	10	9
1.082	250	3	6	9	10	10
1.091	250	2	8	9	9	6
1.094	250	8	9	10	8	7
1.095	250	3	7	7	9	7
1.096	250	8	9	9	10	9
1.189	250	7	nt	9	9	8
1.192	250	7	8	9	10	9

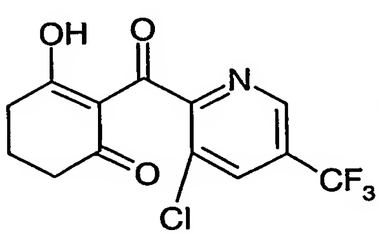
Ex. No.	g/ha	*Digitaria*	*Amaranthus*	*Solanum*	*Nasturtium*	*Stellaria*
1.204	250	8	10	10	10	10
1.209	250	8	9	9	9	9
1.211	250	5	8	8	10	8
1.212	250	3	7	8	8	7
2.010	250	3	8	9	9	8
2.060	250	9	9	10	10	10
2.064	250	9	8	10	10	10
2.075	250	7	6	10	10	9
2.090	250	2	6	10	10	8
2.202	250	6	6	10	10	10

Example B4: Comparison test with a compound from the prior art: Post-emergence herbicidal action:

The post-emergence herbicidal action of compound no. 1.095 according to the invention was compared with compound A, which is described as compound no. 1.005 on page 15, Table 1, of EP-A-0 353 187:



(compound 1.095 according to the present invention)



(compound A from the prior art)

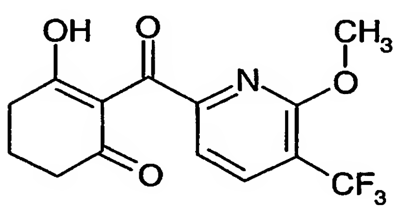
Table B4:

Comp. No.	g/ha	Wheat	Maize	*Sida*	*Ipomea*	*Amaranthus*	*Sinapis*	*Stellaria*	*Galium*
1.095	125	0	0	5	7	7	7	8	6
A	125	0	0	2	2	2	6	9	1

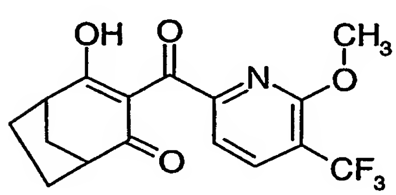
The results in Table B4 show that, at an application rate of 125 g/ha, compound no. 1.095 according to the invention exerts a generally substantially better herbicidal action on the tested weeds than compound A from the prior art. The improved action can be seen especially clearly in the case of the weeds Ipomea, Amaranthus and Galium, where the action of compound A from the prior art is completely inadequate at the tested rates of application. Only in the case of Stellaria does compound A from the prior art exhibit slightly better action. In view of the structural similarity between the compounds, the enhanced action of the compounds according to the invention was not to be expected.

Example B5: Comparison test with a compound from the prior art: Post-emergence herbicidal action:

The post-emergence herbicidal action of compound no. 1.096 according to the invention was compared with compound B, which is described as compound no. 2.088 on page 83, Table 2, of WO-A-0015615:



(compound 1.096 according to the present invention)



(compound B from the prior art)

Table B5:

Comp. No.	g/ha	Wheat	Maize	*Bromus*	*Sida*	*Ipomea*	*Polygonum*	*Stellaria*	*Galium*
1.096	125	0	0	5	7	7	8	8	8
B	125	2	2	0	0	6	4	6	4

The results in Table B4 show that, at an application rate of 125 g/ha, compound no. 1.096 according to the invention exerts a substantially better herbicidal action on the tested weeds than compound B from the prior art. The improved action can be seen especially clearly in the case of the weeds Bromus and Sida, where compound B from the prior art has no action at all at the tested rates of application. In addition, the compound according to the invention not only exhibits better herbicidal action but also exhibits no phytotoxicity whatsoever with respect to the useful plants (in this case, wheat and maize). At an application rate of 125 g/ha, compound B from the prior art already shows significant damage (20 % phytotoxicity) to wheat and maize, which is unacceptable from an agronomic standpoint. In view of the structural similarity between the compounds, the enhanced action and improvement in selectivity of the compounds according to the invention were not to be expected.